MEDICARE ADVANTAGE AND LONG-TERM CARE: IMPACT OF MEDICARE COVERAGE TYPE ON UTILIZATION AND QUALITY OF POSTACUTE AND NURSING HOME SERVICES

by
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Abstract

Medicare, the federal health insurance program, plays an important role in providing health and financial security to older Americans. The role of private plans has become increasingly important now that nearly one third of beneficiaries in Medicare is enrolled in these private, risk-bearing, capitated health plans, currently known as Medicare Part C or Medicare Advantage (MA). In this set of thesis papers, we use several approaches to examine the care received by Medicare beneficiaries, with a particular focus on Medicare Advantage enrollees, in postacute and nursing home settings.

The first study explores the relationship between geriatric risk factors, defined as factors pertinent to frail older adults, and postacute utilization and quality among hospitalized Medicare beneficiaries in Florida from 2010-2014. The paper also describes the differences in postacute utilization and quality between traditional fee-for-service (FFS) Medicare and Medicare Advantage patients. The paper concludes that geriatric risk factors, independent of traditional measures of comorbidity and patient demographics, are highly predictive of postacute utilization and quality. Current administrative claims data can be used to identify additional high-risk patients and predict their healthcare utilization. The paper also finds that there are differences in postacute utilization and quality between FFS and MA hospitalized patients, after accounting for patient characteristics and geriatric risk. As payment reform continue to change toward risk-bearing models, monitoring access, cost, and quality of care among this group of high geriatric risk will become increasingly important.

The second study examines the effect of Medicare Advantage enrollment on postacute utilization in a geographic market. Using Florida 2010-2014, the paper describes county-level effects of MA enrollment on the postacute experiences of fee-for-service Medicare hospitalized patients. Analogous research done in the inpatient and outpatient setting describe significant positive spillover effects of MA into FFS, finding that increased MA enrollment decreased rates of inpatient and outpatient spending and utilization. This paper concludes that MA enrollment has little effect on postacute utilization and quality both within the overall Medicare market and separately within FFS and MA. Further payment policy changes to the MA program should not only monitor inpatient and outpatient utilization and outcomes but also other types of healthcare utilization and quality.

The third study shifts the focus to analyze the care received by Medicare Advantage enrollees in nursing homes. The paper explores the association between quality and staffing levels and the percentage of MA patients in a nursing home facility. Using national data on nursing homes, the paper finds that high percentage of MA facilities are more likely to have greater registered nurse hours on staff but worse clinical quality. Even when national policies required the public reporting of quality measures in nursing homes to help patients select providers, there were minimal associations with changes in percentage of MA patients and quality metrics. The paper concludes that MA patients in nursing homes may be receiving differential care compared to other Medicare beneficiaries and that public reporting of quality may not have great influence on where MA patients receive their care. As MA plans continue to attract a larger share of the

Medicare population, understanding how MA enrollees and plans decide providers and the implications of those choices will improve the MA program and other risk-bearing programs.

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Dedicated to my grandparents

For everything you have taught me about life

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CHAPTER ONE

INTRODUCTION

Introduction

Medicare, the federal health insurance program, plays an important role in providing health and financial security to 60 million older people and younger people with disabilities. In 2017, Medicare spending accounted for 15% of total federal spending and 20% of the total national health spending (Congressional Budget Office [CBO], 2018). As an alternative to traditional fee-for-service (FFS) Medicare program, private managed care plans have been widely available since the 1980s to Medicare beneficiaries. The main policy goal of this program, currently known as Medicare Advantage (MA) or Medicare Part C, was to compete with traditional fee-for-service Medicare to provide the same or expanded Medicare benefits at a lower cost. The role of private plans in Medicare has become increasingly important since nearly one third of beneficiaries is now enrolled in Medicare Advantage (Jacobson, Damico, Neuman, & Gold, 2017).

Older adults on Medicare live with many health problems, including multiple chronic conditions and functional impairments. In 2016, nearly one third of beneficiaries had limitations to at least one activities of daily living and a quarter reported being in fair or poor health (Kaiser Family Foundation [KFF], 2019). As the population ages, the number of patients whose conditions necessitate complex and continuous management will likely increase within the Medicare program. For example, long-term care (LTC) services cover a continuous spectrum from infrequent informal care provided by family members to institutional care at nursing home facilities. Nursing homes provided mainly custodial care to long-stay residents in the 1970s and early 1980s (Grabowski, 2007). A series of policy changes resulted in an expansion of this sector, and by 2004, Medicare

paid for 14% of all nursing home expenditures through postacute services (Grabowski, 2007). At the same time, the proportion of Medicare Advantage enrollees in nursing homes doubled between 2000-2013, reflective of the growth in the number of Medicare beneficiaries enrolled in MA plans (Jung, Li, Rahman, & Mor, 2018).

For many of these medically complex Medicare beneficiaries, the need for postacute services generally precedes the need for long-term care services (Coleman, 2003; Coleman & Boult, 2003; Grabowski, 2007; Murtaugh & Litke, 2002). Postacute care offers important rehabilitation and recuperation services after an acute care hospital stay. In 2015, traditional FFS Medicare outlay for these services, which includes skilled nursing facilities (SNF), home health (HH) agencies, inpatient rehabilitation facilities (IRF), and long-term care hospitals (LTCH), exceeded $60 billion (Medicare Payment Advisory Commission [MedPAC], 2017). Discharges to postacute care facilities rose nearly 50% over the 15-year period between 1996-2010 and was the fastest growing major spending category for Medicare (Burke et al., 2015a, 2015b; Burke et al., 2016; Chandra, Dalton, & Holmes, 2013). As new payment models shift financial responsibility to include entire care episodes, there is now much interest in how capitated private MA plans incentivize care coordination and cost control in postacute contexts.

Despite rapid growth in MA enrollment and the parallel phenomenon of increased demand for postacute care and nursing home services, little is known about use and quality of postacute and nursing home care within those Medicare beneficiaries enrolled in HMOs and other MA private plans. The goal of this thesis is to undertake three inter-related policy relevant analyses to add to the knowledge base in this domain.

The first manuscript (Chapter 2) identifies risk factors associated with postacute utilization among approximately 3 million aged 65 and older hospitalized Medicare Advantage and Medicare fee-for-service beneficiaries in Florida. We also go on to control for these risk factors to examine differences across the cohorts. This chapter relies hospital discharge data abstracted from inpatient billing claims from the state of Florida between the period 2010 and 2014.

The second manuscript (Chapter 3) explores the impact of MA enrollment on postacute utilization within geographic markets across the state of Florida. By expanding the lens to examine market level relationships that may exist between MA and FFS Medicare at the county, an aim of this analysis is to explore the broader implications of capitated at-risk payment programs on care delivery. The main data source for this paper uses hospital discharge data from Florida (above) combined with MA and FFS administrative data publicly available from Centers for Medicare and Medicaid Services.

The third manuscript (Chapter 4) explores the potential impact of Medicare Advantage on overall nursing home care for its enrollees, including both postacute and long-term stay care. This study explores the potential relationship between MA selection and use of nursing homes by staffing and quality levels before and after national nursing home quality reporting programs. The main source of data for this analysis is nursing home level datasets for almost 7,000 US nursing homes for the period 2000-2010 that includes facility characteristics and resident characteristics.

Review of Relevant Policy and Research Literature

This section reviews the relevant policies and literature but is not intended to be comprehensive or systematic review. The goals are to describe the current policy contexts and the emerging issues in health services research relevant to the thesis.

Public and private health insurance

The US healthcare system contains a complex array of public and private entities. Most notably, the public insurance program that covers older Americans, the Medicare program, contains privately administered insurance plans for seniors. The original Medicare program began its origin in 1965 through the Social Security Act as the federal health insurance program for people aged 65 and over, regardless of income, medical history, or health status. By the 1980s, private managed care organizations entered into the Medicare market through the Tax Equity and Fiscal Responsibility Act. It authorized Medicare to contract with risk-based private health plans in exchange for a prospective, monthly, per-enrollee payment. The program's current name, Medicare Part C or Medicare Advantage, currently enrolls one in three Medicare beneficiaries, and the Congressional Budget Office (CBO) projections show Medicare Advantage (MA) enrollment on track to increase steadily through 2028 and to remain as a popular choice among Medicare beneficiaries.

One premise of these privately administered managed care plans is to compete in containing health care costs by stimulating price and quality competition among plans, and studies have shown premiums and benefits to have a significant effect on plan selection in Medicare Advantage (Atherly, Dowd, & Feldman, 2004; Enthoven, 1993).

However, substantial favorable selection exists in MA plans that cause higher payments by Medicare to cover MA enrollees (McGuire, Newhouse, & Sinaiko, 2011). Medicare Payment Advisory Commission (MedPAC) estimated that Medicare paid 102% more to MA for the same beneficiary had they been in FFS in 2016 (MedPAC, 2017). To combat these high costs, enrollment restrictions and more substantial risk adjustments were implemented to reduce selection. The Affordable Care Act (ACA) also implemented payment cuts to MA plans in order to rein in spending. However, there is mixed evidence to suggest that favorable selection has disappeared from the MA program and unexpected increases in enrollment into these plans occurred after payment cuts (Brown, Duggan, Kuziemko, & Woolston, 2014; Landon et al., 2012; Mello, Stearns, Norton, & Ricketts, 2003; Morrisey, Kilgore, Becker, Smith, & Delzell, 2013; Newhouse, Price, Huang, McWilliams, & Hsu, 2012; Newhouse, Price, McWilliams, Hsu, & McGuire, 2015).

By joining MA, beneficiaries typically avoid the substantial cost-sharing that exists in traditional fee-for-service (FFS) Medicare and additional premiums paid for supplementary coverage. MA beneficiaries not only enjoy the same hospital (Part A) and physician (Part B) benefits offered in FFS Medicare albeit with limited networks and utilization review, they also enjoy additional services. For example, in addition to generating savings for the Medicare program, plan costs were expected to be sufficiently low to also support supplemental benefits, such as dental and vision benefits. Furthermore, the Centers for Medicare and Medicaid Services (CMS) continue to propose increased flexibility in MA and redefine health-related supplemental benefits, such as coverage of non-skilled in-home supports and assistive devices (CMS, 2018).

Caring for older adults

The Medicare program, in particular, bears the burden of caring for a growing percentage of older adults with multiple chronic conditions, functional limitations, disabilities, and cognitive impairments (Anderson, 2010; Joynt et al., 2017). For example, ninety-nine percent of Medicare expenditures are for beneficiaries with at least one chronic condition, and the frail elderly are forty-six percent more likely of being in the top ten percent of Medicare spending than disabled or chronically ill patients, largely driven by inpatient and postacute spending (Joynt et al., 2017). While the rise in postacute use and spending in the past decade can be attributed to the underlying need for these services among a growing chronically ill and frail Medicare cohort, financial incentives also play a large role, especially when there are unclear clinical rules concerning the legitimate use of postacute services. Traditional FFS Medicare's payment system for hospitals and postacute care offers little incentive for judicious use of these services (Chen et al., 2017; Huckfeldt, Sood, Escarce, Grabowski, & Newhouse, 2014; McCall, Komisar, Petersons, & Moore, 2001; McCall, Korb, Petersons, & Moore, 2003). Whereas, comparatively, risk-based capitated Medicare Advantage plans have demonstrated some constraints in its use (Huckfeldt, Escarce, Rabideau, Karaca-Mandic, & Sood, 2017; Kumar et al., 2018; Waxman et al., 2016).

Although Medicare has borne out the majority of the responsibility to care for an aging population, custodial nursing home care, a large expense for many seniors, is not covered by Medicare. Instead, for enrollees that meet low-income and resource eligibility thresholds, it is covered by Medicaid. The bifurcated coverage of acute and long-term care under Medicare and Medicaid, respectively, creates narrow interests in limiting each

program's share of costs and management of high quality care. There has been relative little policy attention to risk-based capitated care models that serve a frail, chronically ill, and institutionally based population (Eng, Pedulla, Eleazer, McCann, & Fox, 1997; Grabowski, 2009; Hirth, Baskins, & Dever-Bumba, 2009; Kane, Flood, Bershadsky, & Keckhafer, 2004; Kane, Flood, Keckhafer, Bershadsky, & Lum, 2002). Examples of these programs from the past few decades include Programs of All-Inclusive Care for the Elderly (PACE), EverCare model, and Medicare special needs plans (SNPs). Many of these models struggle to receive enough federal support and to expand. For example, fifty years after PACE began in the 1970s, the program still grapple with efforts to serve more of the nursing home-eligible population nationally (Hirth et al., 2009). The EverCare demonstration model concluded in 2002 without further expansion by CMS, and MA SNP enrollment are concentrated among a small number of states (KFF, 2008). As Medicare Advantage continues to be a popular choice, and as costs continue to rise in the current form of care delivery, a series of new financing and delivery models should integrate health and long-term care services that better serve a growing cohort of older Americans.

Emerging issues in health services

This dissertation addresses emerging issues of risk adjustment and quality reporting that exist under the contexts discussed. The role of risk adjustment is important in health services research for three particular reasons. First, it can identify need for disease management. This is especially pertinent when twenty percent of the population accounts for over eighty percent of healthcare spending (Berk & Monheit, 2001; CBO,

2005). Second, risk adjustment ensures appropriate payment when research and policy outcomes of interest are based on utilization and cost. Finally, risk adjustment can close quality gaps by normalizing the underlying health status of patients being cared for across providers. While there has been significant advancement in recent decades to use administrative-based data to identify clinically high-risk patients (i.e. Charlson comorbidity index, Elixhauser comorbidity index, Hierarchical Conditions Category), there is now a greater push on the systematic documentation, identification, and adjustment of "social risk factors" to ensure equity and fairness (National Academies of Sciences, 2016b). New and emerging data sources and the creative use of existing data are needed to accurately and reliably collect and incorporate into risk measurement and payment ((National Academies of Sciences, 2016a). The recognition is that, beyond the traditional clinical characteristics found in medical billing data, other patient characteristics may affect healthcare outcomes and costs.

The second emerging issue that the dissertation addresses is the growing need for transparency in healthcare. In particular, the use of publicly reported quality measures to direct consumers to the most appropriate care. The phenomenon is not new (Epstein, 1995; Marshall, Shekelle, Leatherman, & Brook, 2000; Sinaiko, Eastman, & Rosenthal, 2012). New York and Pennsylvania developed the first reporting systems for mortality rates after coronary-artery bypass surgery in the early 1990s. The National Committee for Quality Assurance, which develops quality measures and accredits health plans, also began in the early 1990s. Since then, several nonprofit and coalition based groups, along with the federal government, have emerged to develop, standardize, and promote public reporting of quality measures (i.e. National Quality Forum, Leapfrog Group, CMS).

Nursing home quality have been the inquiry of many federal and state investigations and regulations, mostly as a result of state and federal facility licensure and certification requirement and funding (Castle & Ferguson, 2010). In 2002, CMS began a national Nursing Home Quality Initiative (NHQI) as a mechanism to give consumers information and to encourage nursing homes to improve their quality. Since NHQI, there has been a proliferation of national public reporting programs; examples include health insurance plans in the Affordable Care Act (ACA) exchanges and Medicare Advantage offerings, physicians, hospitals, and long-term care providers using Medicare Compare websites, Health Employer Data Information Set (HEDIS), and Consumer Assessment of Healthcare Providers and Systems (CAHPS). The increasing level of public disclosure of healthcare performance is inevitable and will continue to reflect greater demands for information and accountability in the field.

The growing cost of national healthcare expenditures has brought forth payment reform and new financing structures as top priorities in public policy debates. The shift from volume-driven services to value-driven services is demonstrated by the recent proliferation of various value-based programs such as pay-for-performance, bundled payments, accountable care organizations, and global budgets. Under these types of care, risk adjustment and quality programs play prominent roles in advancing healthcare delivery and ensuring equitable design of healthcare policies and programs. Capitated systems, such as the Medicare Advantage program, can elucidate key learnings on how these types of value-based programs deliver and influence care.

Overview of Dissertation and Analytical Approach

The subsequent chapters of this dissertation examine the nature of Medicare Advantage on postacute and nursing home use and outcomes. Drawing upon a range of methodologies to assess how the MA program utilizes postacute and nursing home care, the following chapters explore if MA differentially utilizes postacute care from traditional fee-for-service Medicare, if that differential care pattern influences FFS care delivery, and if MA plans respond to quality reporting.

Chapter 2 examines the postacute experiences of Medicare patients discharged from an inpatient hospital stay in Florida hospitals from 2010-2014. Florida represents 10 percent of all Medicare Advantage enrollees nationally, and 42 percent of Florida Medicare beneficiaries are enrolled in MA. We conceptualize measures of geriatric risk, which represents factors pertinent to frailty, functional limitations, and other risk factors in older adults, and explore the role of risk adjustment on postacute utilization. Using these additional factors in multivariate regressions to control for selection into MA plans, we find that MA discharges are more likely to be discharged to home and home health, are less likely to be discharged to skilled nursing, and are less likely to be readmitted within 30 days than FFS discharges. We propose that non-traditional comorbidity factors should be included in payment policies and conclude that MA plans may be utilizing less resource intensive services for their patients than traditional FFS Medicare.

In Chapter 3, using methods to combat potential endogeneity between healthcare utilization and Medicare Advantage insurance entrance and enrollment in these plans, we explore relationships that exist within geographic markets using the same Florida dataset. We use instrumental variables estimation to model the effect of MA enrollment at the

county level on FFS postacute utilization. We find weak relationships between MA enrollment on FFS postacute use. This result suggests that MA practice patterns may not influence FFS delivery in postacute services, unlike findings in inpatient and outpatient services. Additional payments to MA plans should carefully consider the types of beneficial spillover effects the program has on medical services.

Chapter 4 uses a separate dataset on nursing homes at the national level from 2000-2010 to explore longitudinal relationships of quality and the type of residents nursing homes serve.

Leveraging policy changes occurring in the study period, we use a pre-post design and multivariate linear regression models to investigate whether nursing homes receiving high quality scores experienced higher enrollments by MA patients after scores were publicly reported. We find that there are no changes in the share of MA nursing home residents post public reporting, suggesting that MA plans may not be contracting with nursing homes based on publicly reported quality.

Chapter 5 summarizes the findings and discusses the limitations and strengths of each study. We conclude with the policy implications and future areas of research.

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CHAPTER TWO

THE ROLE OF GERIATRIC RISK ON POSTACUTE UTILIZATION AND OUTCOMES IN HOSPITALIZED MEDICARE BENEFICIARIES

Abstract

Background: Postacute care represents important rehabilitation and recuperation services delivered to Medicare beneficiaries after an acute care hospital stay. Of particular interest within the cohort of postacute users is the frail elderly and other vulnerable populations with disabilities and multimorbid conditions associated with high cost and need. The impact of different payment incentives on postacute utilization and outcomes in this high-risk cohort has not been fully explored. This study helps address this gap by 1) assessing the impact of geriatric risk factors on postacute utilization and outcomes among hospitalized Medicare patients, and 2) examining whether differences in postacute utilization between Medicare Advantage and fee-for-service Medicare patients persist after controlling for geriatric conditions.

Methods: Hospital discharge abstract data from Florida from 2010 to 2014 is used for this study. Geriatric risk concepts are conceptualized and step-wise multivariate linear regressions are used to study the associations of geriatric risk on postacute utilization and readmissions among Medicare Advantage and fee-for-service Medicare beneficiaries.

Results: The study found that geriatric risk concepts are independently associated with postacute utilization and quality in addition to patient demographics and traditional measure of comorbidity. High geriatric risk patients are less likely to be discharged home or to home health care. There are also differences between MA and fee-for-service Medicare postacute use, after accounting for patient demographics, comorbidity, and

geriatric risk. Hospitalized Medicare Advantage patients are more likely to be discharged home or to home health services than fee-for-service Medicare patients and less likely to be readmitted within 30 days of hospital discharge.

Conclusion: As services are increasingly bundled and paid for on the basis of achieving quality targets, this study's results can be applied to help optimally match high risk patients to appropriate postacute services and to evaluate alternative delivery models.

Introduction

The Affordable Care Act included provisions designed to reduce hospital spending and increase value. Programs such as the Hospital Readmissions Reduction Program (HRRP), Hospital Value Based Purchasing (VBP) Program, and bundled payment programs all focus on the hospital stay and associated transition periods. Postacute care (PAC) offers important rehabilitation and recuperation services for Medicare beneficiaries after an acute care hospital stay. Recent efforts aim to bring postacute providers under the same payment incentives as current acute care programs (i.e. home health VBP and skilled nursing facility VBP). Postacute spending is one of the key drivers of geographic variation in per capita fee-for-service (FFS) Medicare spending (Hussey, Huckfeldt, Hirshman, & Mehrotra, 2015; Newhouse & Garber 2013). In 2015, traditional Medicare outlay for these services, which includes skilled nursing facilities (SNF), home health (HH) agencies, inpatient rehabilitation facilities (IRF), and long-term care hospitals (LTCH), exceeded $60 billion (Medicare Payment Advisory Commission [MedPAC], 2017). Discharges to PAC facilities rose nearly 50% (1.2 million more discharges) over the 15-year period between 1996-2010, making it the fastest growing of Medicare's major spending categories (Burke et al., 2015a, 2015b). Despite this rapid increase in postacute spending, there is little improvement in reductions of Medicare discharged patients' mortality during the same period (Chandra, Dalton, & Holmes, 2013).

Of particular interest within the cohort of postacute users is the frail elderly and other vulnerable populations with disabilities and multimorbid conditions (Joynt et al., 2017; Long, 2017). Fifty-one percent of patients discharged to PAC facilities are aged 80

years and older and 40% of hospitalizations in this age group end with a postacute stay (Burke et al., 2015a). The prevalence of frailty among adults aged 65 years and older is estimated at 15%, with the highest prevalence at 38% in those aged 85 years and older (Bandeen-Roche et al., 2015). Much of the care delivered to this cohort of medically complex elderly is inadequate, particularly during care transitions, where studies have shown patients are often unprepared for self-management roles. Furthermore, safety issues arise because of medication errors and incomplete information transfer across settings (Coleman, 2003). Despite recent research that suggests that functional status and frail factors outperform comorbidity in predicting outcomes of acute care (Greysen, Stijacic Cenzer, Auerbach, & Covinsky, 2015; Johnston, Wen, Hockenberry, & Joynt Maddox, 2018; Meddings et al., 2017; Shih et al., 2015), only a few studies have directly examined the relationship between postacute use for Medicare beneficiaries and geriatric risk factors, such as frailty or functional impairment (Burke et al., 2016; Greysen, Stijacic Cenzer, Boscardin, & Covinsky, 2017; Kumar et al., 2017; Middleton et al., 2016). None examine nor compare postacute use within a capitated financial system for this high need population.

As an alternative to FFS Medicare, private managed care plans, known as Medicare Advantage (MA), have become increasingly important; nearly one third of beneficiaries are now enrolled in MA. In contrast to traditional FFS Medicare, MA plans negotiate contracts with providers of PAC and pay for their services out of the monthly capitated payments the plans receive for each covered enrollee. Capitated MA plans benefit financially from avoiding unnecessary postacute care, and thus may have a greater interest in carefully selecting and coordinating post-discharge care than do

providers who are not at risk. Previous studies have shown that MA plans often require prior authorization and the use of a preferred network of PAC providers (MedPAC, 2015; Meyers, Mor, & Rahman, 2018). MA enrollees also experience higher cost sharing for skilled nursing facilities and hospitalizations compared to FFS Medicare beneficiaries without supplemental coverage (Keohane, Grebla, Mor, & Trivedi, 2015). For a medically complex cohort of enrollees, these restrictions may be a deterrent for MA enrollment or once enrolled, an impediment for necessary postacute use. Studies have examined differential postacute use between MA and FFS patients, finding that MA patients utilize less PAC and lower intensity of these services (Huckfeldt, Escarce, Rabideau, Karaca-Mandic, & Sood, 2017; Kumar et al., 2018; Waxman et al., 2016).

The impact of MA payment incentives on postacute utilization and outcomes for higher risk patients has not been explored. To help address this knowledge gap, this study assesses the impact of geriatric risk factors on postacute utilization and outcomes in hospitalized Medicare patients. The study also examines whether differences in postacute utilization between MA and FFS patients persist after controlling for geriatric related risk. Understanding how MA plans manage the hospital to postacute transitions for this high-cost and high-need population may also provide insights on whether capitated systems provide care for this population more efficiently and appropriately compared to FFS Medicare.

Background

Accounting for social risk factors

As policy goals move toward incentivizing high quality and efficient healthcare systems and reducing disparities, payment strategies should also align with those incentives. In a 2017 report "Accounting for Social Risk Factors in Medicare Payment," the National Academy of Science found compelling reason to include various risk factors in Medicare quality and measurement programs (National Academies of Sciences, 2016).

An expanding stream of literature examines the role of social risk factors on various VBP programs in the acute setting and find that without accounting for these social factors, providers serving disproportionate share of low-income patients would be unfairly penalized under such programs (Calvillo-King et al., 2013; Kind et al., 2014; Shih et al., 2015). For example, social characteristics such as dual eligible status and area-level socioeconomic status such as educational attainment, poverty rates, household income, and proportion of residents living alone accounted for 54% of the difference estimated with current Center for Medicare and Medicaid Services (CMS) clinical risk adjustment in the HRRP (Roberts et al., 2018).

Beyond these social factors, other research also specifically examines the role of functional limitations and cognitive risk factors not captured by traditional comorbidity measures on readmissions and other healthcare utilization in FFS Medicare cohort (Greysen et al., 2015; Johnston et al., 2018; Meddings et al., 2017). Self-reported neuropsychological and functional impairment are common in Medicare beneficiaries and are associated with $900-$3,000 higher Medicare total annual cost of care, even after accounting for comorbidities (Johnston et al., 2018). Both Meddings et al. (2017) and Greysen et al. (2015) find that functional impairment, disability and social determinants of health is associated with increased readmission risk for pneumonia, heart failure, and

acute myocardial infarction hospitalized FFS Medicare patients beyond current CMS risk adjustment.

Studies that examine the role of these functional and cognitive indicators in FFS Medicare postacute users find that they are prevalent and lead to higher healthcare utilization and costs (Burke et al., 2016; Greysen et al., 2017; Kumar et al., 2017; Middleton et al., 2016). For example, functional impairment has been associated with greater Medicare costs for postacute users that cuts across clinical conditions (Greysen et al., 2017). Cognitive and motor functional status are some of the strongest predictors of 30-day readmissions following postacute (Burke et al., 2016; Middleton et al., 2016). Shih et al. (2016) examine all inpatient rehabilitation users from 2002-2011 and find that functional impairment models outperforms demographic and comorbidity models in predicting 30-day readmissions. However, no research examines the role of these conditions in the Medicare Advantage population and its impact on postacute use. Further, no comparison has been done between a capitated system and fee-for-service system to test if postacute utilization and outcomes differ among this vulnerable cohort of older adults.

Differences in MA and FFS postacute utilization

Current studies that examine differences in postacute utilization and outcomes between MA and traditional FFS Medicare enrollees do not control for these functional and geriatric conditions, which may bias results if MA patients are less functionally dependent or frail (Huckfeldt et al., 2017; Waxman et al., 2016). Previous studies have suggested that there is favorable selection into MA plans from FFS Medicare, and while

new risk adjustment models instituted in 2004-2007 may have tempered some of the original selection, the CMS hierarchical condition categories (HCC) model do not adjust beyond demographic and clinical diagnosis (McWilliams, Hsu, & Newhouse, 2012; Newhouse & McGuire, 2014; Shimada et al., 2009). In self-reported health, beneficiaries who rate their health as "fair" or "poor" are less likely to be enrolled in MA than beneficiaries in "good" health (Shimada et al., 2009). Beneficiaries in fair and poor health tend to be associated with less positive Consumer Assessment of Health Care Providers and Systems (CAHPS) ratings than better health beneficiaries, and differences in these scores between fair/poor health patients versus better health patients tend to be larger in MA patients than in FFS suggesting there may be opportunities for improving experiences of vulnerable beneficiaries within MA plans (Elliott, Haviland, Orr, Hambarsoomian, & Cleary, 2011).

Studies that do control for cognitive and physical functioning examine limited clinical cohorts and postacute destinations, and only examine discharges from hospitals receiving disproportionate share (DSH) payments (Huckfeldt et al., 2017; Kumar et al., 2018; Waxman et al., 2016). For example, Kumar et al. (2018) examine rehabilitation use of MA and FFS Medicare patients with hip fractures from hospitals receiving DSH payments. They find that MA patients are less cognitively impaired upon postacute admission than FFS patients, and that after adjusting for activity of daily living (ADL), pain, body mass index (BMI), and cognitive scores, MA patients are more likely to be discharged to the community successfully after rehabilitation and have shorter course of rehabilitation. Waxman et al. (2016) compare home health utilization between MA and FFS patients, controlling for median household income in the zip-code and proportion of

households with one resident, and find that MA beneficiaries use less home health but regional factors affect utilization independent of insurance coverage. Huckfeldt et al. (2017) examine cohorts of joint replacement, stroke, and heart failure from hospitals receiving DSH payments discharged to SNF and IRF, controlling for dual eligible status, Part D Low-Income subsidy status, and diagnoses-based clinical characteristics (i.e. Elixhauser and condition-specific severity measures). They find that MA patients are less likely to be admitted to IRFs and have shorter lengths of stay in SNFs than FFS patients, while finding no differences in observable characteristics between the two cohorts. These limitations restrict our understanding of payment incentives on postacute use because specific clinical cohorts to limited postacute destinations from DSH hospitals may not be representative of the broader Medicare context nor do they provide context on possible substitution of services (i.e. low-cost home health services) by capitated systems.

New contribution

This study expands on previous work through two mechanisms. First, it tests for administrative claims-based geriatric characteristics prevalent in older adults that may not be captured by disease characteristics assessed in previous studies. Prior studies that examine frailty and other types of functional status indicators use survey and assessment information, which are difficult to obtain and to apply to a large population. Recent studies have advanced the use of administrative claims datasets to examine frailty and other conditions prevalent in frail and disabled older adults (Kan et al., 2018; Kim et al., 2017; Segal et al., 2017). The ability to use readily available administrative claims data to capture these conditions would prove useful categorizing large cohorts of patients not

subject to in-person clinical assessments (i.e. MDS, OASIS, IRF-PAI) or Medicare surveys (i.e. MCBS, HRS, NHATS). For case managers and post discharge facilities with limited assessment information, the ability to target high risk patients using inpatient claims data for postacute use may prove useful to coordinate care transitions.

Second, this study expands similar analyses beyond only hospitals that receive disproportionate share payments, which are potentially biased toward safety-net and urban hospitals (Jha, Orav, & Epstein, 2011; Joynt & Jha, 2013), to all hospitals located in a large state with Medicare beneficiaries to capture the variability in hospital practices and quality. We also expand the population studied to all four types of postacute facilities covered by Medicare and examine all postacute users and for several common disease cohorts. The expansion to cover all postacute facilities may provide insights as to whether patients are transitioned to PAC differentially based on risk categories, or by payor, to lower or higher cost facilities. This study's assessment of the impact of payment coverage on postacute utilization and outcome will be useful to policymakers who may be interested in evaluating MA relative to the FFS Medicare program.

This study examines the role of various geriatric characteristics in predicting postacute utilization and outcomes in hospitalized MA and FFS Medicare patients. To determine a potential explanation for differences in use of postacute care and patient outcomes, the study investigates whether these geriatric characteristics could explain some of the differences in postacute use between MA and FFS hospitalized patients. Specifically, hospital discharge data in Florida from 2010 to 2014 is used to describe and compare MA and FFS hospitalized beneficiaries in terms of their discharge to postacute, the length and cost of the inpatient hospitalization, and hospital readmissions.

Methods

Data sources

Healthcare cost and utilization project's (HCUP) state inpatient databases (SID) includes the universe of all discharges, including information on insurance provider and discharge destination. The study uses data for Florida 2010-2014. There are several advantages to using Florida. First, Florida accounts for 10% of all Medicare Advantage enrollees nationally (Kaiser Family Foundation [KFF], 2017). Second, 42% of Medicare beneficiaries are enrolled in Medicare Advantage in Florida in 2017 (Jacobson, Damico, Neuman, & Gold, 2017). Third, Florida SID reports whether Medicare enrollees are in FFS or an MA plan and their discharge destination, including postacute facilities. Finally, Florida datasets include visit links to allow for identification of readmissions to inpatient hospitals.

The study focused on Florida hospitals 2010-2014 for Medicare beneficiaries with an inpatient hospital stay who were either discharged to home or to a postacute facility. All other discharges were excluded (i.e. left against medical advice, died, discharged to hospice care), as well as patients who did not reside in Florida, who were less than 65 years of age, and observations from hospitals with less than ten postacute discharges each year by Medicare patients. First, the overall sample was examined, and then the sample was restricted to those Medicare beneficiaries receiving inpatient care for three common conditions receiving postacute care: stroke (DRG 61-66), joint replacement (DRG 469, 470), heart failure (DRG 291-293) to create a more homogenous clinical cohort receiving postacute service. Because there is large variation in receiving postacute services, restricting to common disease cohorts receiving postacute care can potentially isolate

further utilization differences as a result of payment incentives and patient characteristics (Kane, Lin, & Blewett, 2002). Beneficiaries were determined to be enrolled in traditional FFS Medicare or in Medicare Advantage for the inpatient stay through the state inpatient discharge data by primary payer type. In the Florida sample, more than 45% of all inpatient discharges are attributable to Medicare patients, and 31% of those were in MA. Of these Medicare discharges, 89% are to home and postacute facilities, with hospice care as the next most popular discharge destination (4%) and inpatient death as next most prevalent discharge status, accounting for 3% of discharges.

Study variables and measures

Geriatric risk

The geriatric risk measure was constructed from diagnoses and procedure codes from the inpatient hospitalization. The original measure was developed in Medicare cohort to predict healthcare utilization (Weiner et al., 1996) and has been since adapted by clinicians and geriatricians to capture concepts prevalent in frail older adults and adults with disabilities and other multi-morbid conditions. This geriatric risk measure has been shown to predict higher healthcare utilization and outcomes beyond traditional comorbidity measures (Wu et al., 2019), and it is a modified version of capturing frailty in administrative claims dataset (Joynt et al., 2017). In comparing this claims-based measure against a validated survey-based frailty measure on health utilization and functional outcomes, claim-based model performed as well if not better as measured by c-statistics (Wu et al., 2019). These conditions include vision problems, urinary and fecal incontinence, difficulty walking, history of falls, pressure ulcers, dementia/cognitive

impairment, lack of social support, weight loss, and malnutrition (Health). Based on the distribution, we categorize the cohort into non-risk (meeting 0 conditions), moderate risk (meeting 1 condition), and high risk (meeting 2+ conditions). The distribution of these concepts is presented in Appendix Tables 1-2.

Risk adjustment

Patient-level adjusters include age, race, and sex, derived from the HCUP hospital discharge file. In addition to demographics, Charlson comorbidity index was constructed from diagnoses codes of the inpatient hospitalization (Deyo, Cherkin, & Ciol, 1992). The Charlson was used because of the feasibility of its calculation using only inpatient claims codes compared to other comorbidity measures that utilize both outpatient and inpatient information (i.e Elixhauser, HCCs, ACGs), given that we do not have outpatient information (Charlson, Pompei, Ales, & MacKenzie, 1987). Condition–specific severity measures indicators were also derived and included for each disease specific cohort (Buntin et al., 2005; Huckfeldt, Mehrotra, & Hussey, 2016). For clinical cohort models, joint replacements have indications whether the patient had morbid obesity; stroke has indication if it was hemorrhagic; heart failure has indication if it was chronic or acute.

Finally, socioeconomic factors from the Area Health Resource File (AHRF) and the American Community Survey (ACS) were used to merge to the patients' county of residence. The number of skilled nursing facilities, home health agencies, and physicians per capita were used as supply-side controls to control for potential access to postacute facilities and intensity of hospital care. Controls for socioeconomic status were also used and include county's % poverty, % unemployment, median income quartile, and an

indicator for metropolitan status. These controls are used because MA plans tend to operate in urban counties with higher FFS spending. Family composition was also controlled by using the county's percentage of adults older than 65 years of old who are married as literature has suggested family support may influence discharge destinations (Kane et al., 2002).

Outcome variables

Postacute utilization. Several outcome measures are constructed using the HCUP data. First, the probability of discharge home (versus a postacute facility) was constructed using the discharge destination information. Among the PAC users, the probability of entering each of the four types of postacute facilities (skilled nursing, home health, inpatient rehabilitation, and long-term care hospital) was also examined.

Inpatient utilization. Second, both the length of stay and total cost of the inpatient hospital stay were examined for postacute users to measure the severity of patients receiving postacute use care. The HCUP data reports total inpatient facility charges, which can be converted to costs by multiplying the hospital's cost-to-charge ratio obtained from HCUP. The cost-to-charge ratio is calculated annually for each hospital using information from the hospital's Medicare Cost Reports.

Postacute outcome. The HCUP data also allow for the calculation of hospital readmissions as a measure of quality of care through revisit links. This quality measure is constructed by first excluding planned inpatient readmissions, and then linking revisit variables within the year to calculate 30-day readmissions from the inpatient hospital

stay. Thus, the fourth outcome measure assessed is the all-cause unplanned inpatient readmission within 30-days after a discharge to postacute care.

Statistical method

Cross-sectional within hospital analyses were performed, comparing episodes of care following hospital discharges for patients with Medicare Advantage and FFS Medicare coverage. First, differences in patient composition were investigated by comparing both groups of patients in their demographic characteristics (sex, age, race and ethnicity), Charlson comorbidity index, condition-specific severity measure, geriatric risk categories, and socioeconomic factors as described above.

Then, the association of geriatric risk on postacute utilization and outcomes was assessed for MA and FFS separately using multivariate linear regressions. For binary outcomes, the coefficients indicate the predicted probabilities of each outcome**.** Goodness-of-fit test are reported for each type of model specification (R^2, root mean squared error, and c-statistic). First, base models of age, race/ethnicity, race, Charlson comorbidity index, and socioeconomic status were run in predicting outcomes of discharges home, 30-day readmissions, inpatient lengths of stay and cost, and postacute destination. Then, geriatric risk categories were added to test if these factors are independently associated with utilization and outcomes. All models also adjusted for the discharging hospital, year of the hospital discharge, and clustered error terms at the hospital level to account for correlation of model within hospitals. These results are presented in Table 2 and 3 for MA and FFS patients. Results for each of the three distinct disease specific cohorts is presented in Appendix Tables 3-4.

To compare postacute utilization and outcomes between MA and FFS hospitalized patients, multivariate linear regressions were run to test for differences after adjusting for geriatric risk factors. In the main analyses, the full Medicare hospitalized sample was compared on the same series of outcomes as described above. All models adjusted for demographic characteristics (age, sex, race/ethnicity), clinical status (condition specific severity, Charlson comorbidity index), geriatric risk, and socioeconomic factors. To account for differences in the hospitals from which the two groups of patients were discharged, the main regression specifications also adjusted for the discharging hospital; thus, the estimated differences again reflect within-hospital differences in postacute care received by hospitalized patients. The year of the hospital discharge was also adjusted to account for yearly differences. Finally, error terms are clustered at the hospital level to account for correlation of model within hospitals. Subsequently, models are also run in each disease specific cohort of stroke, joint replacement, and heart failure.

Sensitivity analyses

For total cost outcome, multivariate linear models using log costs were also run as sensitivity analyses given the heavily skewed distribution in inpatient costs (Appendix Figure 1, Appendix Tables 5-6. Postacute destinations are also modeled using multinomial logit models to account for categorical outcomes. The relative risk ratios of these estimates are presented in Appendix Tables 9-10. Logistic models were run for outcomes of discharge home and 30 days readmissions to confirm linear probability

models (Appendix Tables 11-12). Outcomes of 30 day readmissions are also tested for each type of discharge destination (Appendix Tables 7-8).

Results

Descriptive statistics

3,098,369 Medicare discharges to home or postacute facilities occurred during 2010-2014 in Florida. Fifty-two percent of these discharges were to a postacute facility. Thirty-one percent of all discharges to home and postacute were covered by MA, whereas 27% of all discharges to postacute were covered by MA (Table 1). Of postacute discharges, patients with FFS coverage were older and more likely to be female and white. Additional clinical characteristics indicate that FFS patients discharged were not sicker as measured by the Charlson comorbidity index, but they were more likely to be categorized as high geriatric risk than MA discharges based on geriatric risk categories. Eleven percent of postacute FFS patients discharged were categorized as high risk compared to 8% of postacute MA discharges. Compared to MA discharges, discharges covered by FFS were also less likely to be discharged home (44% vs. 56%) and more likely to be readmitted to the hospital within 30 days after a postacute stay (21% vs. 18%). FFS postacute discharges were also more likely to be in skilled nursing facilities (SNFs) (49% vs. 45%) and inpatient rehabilitation facilities (IRFs) (7% vs. 4%) and less likely to be in home health agencies (HHAs) (43% vs. 50%) than MA postacute discharges.

Geriatric risk

Geriatric risk is a robust predictor of postacute utilization (Table 2). When the measure of geriatric risk categories is added in addition to demographic, comorbidities, and socioeconomic factors, geriatric risk categories are independently associated in a dose response fashion. In the MA population, discharges with high geriatric risk are 40% less likely to be discharged home compared to non-risk discharges; discharges that are categorized as moderate risk are 26% less likely to be discharged home. Similarly, in the FFS population high risk discharges are 35% less likely to be discharged home than non-risk discharged patients, and moderate risk patients are 24% less likely compared to those with no risk. In both MA and FFS discharges, high geriatric risk postacute patients stay longer in the inpatient setting and cost more than non-risk patients (MA: 1.25 days, $1,892, $p<0.01$; FFS: 1.23 days, $1,433 $p<0.01$, respectively). Moderate risk postacute discharges also stay longer and cost more than non-risk discharges but the effect is attenuated. There are smaller effects of geriatric risk on 30-day readmissions, where the association predicts <1% likelihood between high and moderate risk discharges to non-risk discharges. These results remain robust in disease specific cohort models (Appendix Table 3) and in corresponding logistic models (Appendix Table 11). We found improvements in corresponding goodness-of-fit tests throughout geriatric risk models.

In addition, high geriatric risk discharges are discharged to postacute destinations differentially than non-risk discharges (Table 3). Compared to non-risk discharges, high-risk discharges are more likely to go to SNFs (26%-28%; $p<0.01$) and less likely to go to HHA (28%-30%; $p<0.01$) in both MA and FFS. The association is attenuated in moderate risk discharges. High and moderate risk discharges are also slightly more likely to go to IRFs and LTCHs than non-risk discharges though the association is small. These results

remain robust in disease specific cohort models (Appendix Table 4) and in multinomial logit models (Appendix Table 9). For discharges to home and home health, high geriatric risk is associated with increased probability of being readmitted within 30 days compared to non-risk discharges across MA and FFS discharges, though the effect is small at 1-2% ($p<0.01$) (Appendix Table 7). For discharges to more care intensive facilities, such as SNFs, high risk discharges are less likely to be readmitted within 30 days compared to non-risk discharges across MA and FFS, though again the effect is small at 1% ($p<0.01$).

Postacute utilization and outcomes between MA and FFS

Differences in postacute utilization and outcomes persist between MA and FFS patient discharges after controlling for geriatric risk (Figure 1 and Table 4). MA patients are 6% more likely to be discharged home than FFS counterparts (6%, $p<0.01$). MA postacute discharges have similar inpatient lengths of stay but are more likely to cost more for their inpatient stay than FFS postacute discharges and less likely to be readmitted in 30 days ($585, $p<0.01$; 4%, $p<0.01$). These results remain robust in corresponding logistic models (Appendix Table 12). Compared to FFS postacute discharges, MA postacute discharges are more likely to use HHAs (5%, $p<0.01$) and less likely to use IRFs (4%, $p<0.01$) and LTCHs (1%, $p<0.01$). In multinomial logit models (Appendix Table 10), MA discharges are less likely to use these resource intensive destinations (SNFs, IRFs, and LTCHs vs. HHAs) compared to FFS discharges. Among all discharge destinations, MA patients are less likely to be readmitted within 30 days compared to FFS discharges (Appendix Table 8). MA home, SNF, and HHA discharges

are 1% less likely to be readmitted compared to FFS ($p<0.01$). MA IRF and LTCH discharges are 14%-16% less likely to be readmitted compared to FFS ($p<0.01$).

Differences in postacute utilization and outcomes in specific disease cohorts were also examined (Table 5). For stroke discharges, MA discharges are more likely to go home (2%, $p<0.01$), less likely to be readmitted (10%, $p<0.01$), and differ in their postacute destination than FFS discharges. They are more likely to go to SNFs (9%, $p<0.01$) and HHAs (4%, $p<0.01$) and less likely to go to IRFs (13%, $p<0.01$) than FFS. For joint replacement discharges, there are fewer differences. MA discharges are less likely to be readmitted (5%, $p<0.01$) and go to IRFs (6%, $p<0.01$) and more likely to go to SNFs (5%, $p<0.01$). There are no differences in the probability of being discharged home and in lengths of stay and cost of the hospitalization between MA and FFS joint replacement discharges. Finally, for congestive heart failure discharges, MA discharges are less likely to go to SNFs (4%, $p<0.01$) and more likely to go to HHA (7%, $p<0.01$) compared to FFS discharges. MA discharges are also less likely to be readmitted (2%, $p<0.01$) and more likely to be discharged home (7%, $p<0.01$) compared to FFS discharges.

Discussion

We find that geriatric risk factors that can be measured using administrative claims are associated with higher postacute utilization among hospitalized Medicare patients. Further, we find postacute utilization and outcome differences persists between Medicare Advantage and FFS Medicare patient discharges after controlling for demographic, comorbidities, socioeconomic, and geriatric risk factors. High geriatric risk

patients are less likely to be discharged home or to home health care, more likely to have longer lengths of inpatient stay, cost more, and more likely to be discharged to skilled nursing facilities. Hospitalized MA patients are more likely to be discharged home than FFS patients. Furthermore, hospitalized MA discharges who utilize postacute are less likely to be readmitted within 30 days and are more likely to be discharged to home health agencies than FFS discharges. However, MA inpatient total cost exceeds their FFS counterparts. This may suggest that MA plans may be managing their patients better than FFS in that those who are truly sick (i.e. higher IP costs) are the ones more likely to be utilizing postacute services.

For specific disease cohorts, MA also utilize postacute destinations differently than FFS. For heart failure patients, MA discharges are less likely to be discharged to SNFs and IRFs and more likely to be discharged to HHA. For joint replacement patients, MA discharges are more likely to utilize SNFs and less likely to utilize IRFs. For stroke patients, MA discharges are more likely to be discharged to SNFs and HHA, but less likely to be discharged to IRFs. Despite differential discharge destinations, MA discharges do not have worse outcomes (as measured by 30 day readmissions) by different discharge destinations. Monitoring where FFS patients are discharged to provide high quality care at lower costs may be needed to provide efficient care.

Implications for policy and practice

These findings suggest that adjusting for geriatric risk measures beyond traditional comorbidity measures may be helpful for hospitals, postacute facilities, and case managers to assess the appropriateness of postacute services for hospitalized patients

without the need to conduct time-intensive clinician-completed assessments. Administrative-based frailty indices and geriatric concepts may be able to categorize larger cohorts of hospitalized patients. For example, rather than waiting for assessments to be completed after discharge to postacute through MDS, OASIS, or IRF-PAI, case managers and postacute facilities could utilize inpatient claims information to help assess appropriate discharge destinations and patients' level of risk and guide discharge planning. Hospitals and postacute facilities could also focus on these high-risk patients during the transition period to ensure proper medication management or prioritize information transfer across facilities.

Further, the added predictive value of geriatric risk measure indicate that these factors may be important to measure and incorporate into risk adjustment for payment policies or quality reporting. While this study does not answer the debate whether to include 'social risk factors' in risk adjustment for Medicare payment models, it does demonstrate that certain non-clinical factors can be conceptualized using existing administrative data, are predictive of utilization, and do narrow differences across payment models when assessing utilization and costs. Payment policies that do not currently incorporate these predictive factors of utilization and cost may be hurting providers who care for a large cohort of these patients. Quality reporting that do not account for these measures may also be underestimating the quality of care provided.

Persistent postacute utilization and outcome differences (after accounting for measurable and observable patient characteristics) between MA and FFS discharges suggest that MA may be managing their high cost and high need patients better than FFS. MA plans appear to manage postacute differently than FFS Medicare with no observable

negative consequences. For example, MA patients are more likely to utilize home health care, which is less expensive than skilled nursing or inpatient rehabilitation facilities. However, care should be given to these interpretations given that there might be unobservable patient characteristics not captured by current risk adjustments. Policies should first work to incorporate these measurable and observable characteristics in evaluations and second consider the value add of the Medicare Advantage program, and other types of risk-bearing and capitated programs, in Medicare. For example, it will be important to monitor how these vulnerable high geriatric risk patients fair under FFS postacute VBP and other payment structures (i.e. bundled programs) in order to ensure that postacute facilities and capitated programs do not cherry pick low risk patients and the type of care they provide for this high risk group is appropriate.

Limitations

There are several limitations of our study to note. Postacute use or long-term use cannot be differentiated in the HCUP dataset. For example, if a patient was admitted to the hospital from a nursing home because they are long-stay nursing home residents and are discharged back to a skilled nursing home, we are unable to exclude this patient from our postacute analyses. Second, MA plans have institutional special needs plans (i-SNPs) that may especially target frail elderly patients. While we were unable to distinguish these plans from the dataset, we still find that our sample of MA patients have less geriatric risk than FFS patients. In 2014, 2,706 beneficiaries were enrolled in i-SNP plans in Florida out of 1.3M Medicare Advantage enrollees (<1%) indicating they represent a

very small fraction of beneficiaries (KFF, 2014). Geriatric risk measure was also built on inpatient claims only; further modeling should examine the addition of outpatient claims.

Third, previous literature has suggested that the availability and access to postacute facilities and providers is an important factor in utilization levels. While we do not have information on the patients' available choice of postacute facilities, we do attempt to control for the supply of each postacute provider in the patients' county of residence. Fourth, we also do not have information about mortality outside the inpatient setting. This may explain why prediction for readmissions is lower than we expect: patients are not returning to the inpatient hospital setting due to death. We test for the association of geriatric risk on readmissions each discharge destination cohort to test if high-geriatric risk patients who are discharged home or home health (presumably healthier and thus less likely to experience death) are more likely to be readmitted and find that high-risk and moderate discharges are more likely to be readmitted than non-risk discharges in both MA and FFS (Appendix Tables 7-8).

We assume that we have sufficiently captured differences in patient compositions with our observed characteristics to test for utilization and outcome differences between MA and FFS discharges. While we examine characteristics pertinent to older adults beyond the traditional comorbidity measure, we cannot infer causality from MA coverage on postacute utilization if we have not captured all differences in patient composition. In particular, we might be concerned with the cohort of inpatient stay patients. Prior research has suggested that MA enrollees are less likely to be admitted to the inpatient setting in the first place, suggesting that those who are less healthy may be captured by our MA inpatient sampling (Afendulis, Chernew, & Kessler, 2017). Finally, the current

data is also limited to Florida during 2010-2014; while it is a large state with a large proportion of Medicare beneficiaries, we cannot generalize these results to the current full Medicare program.

Conclusion

Despite these limitations, this study expands our existing knowledge of the role of non-traditional comorbidity factors on healthcare utilization and outcomes and on how Medicare Advantage utilizes postacute services compared to FFS Medicare for hospitalized Medicare beneficiaries. We do this on a particularly vulnerable cohort of high geriatric risk hospitalized patients. This study suggests that high risk hospitalized patients, as measured by a claims-based risk measure, utilize postacute services differently. As services are increasingly bundled and paid according to the quality of care they provide, it is important to optimally match high risk patients to appropriate postacute services. Further research is needed to evaluate the efficiency of the MA program on postacute service delivery compared to that of the FFS program, especially among a cohort of high risk Medicare beneficiaries.

Table 2.1: Characteristics of hospitalized Florida Medicare discharges to home and postacute facilities (2010-2014)

	All Discharges		Postacute Discharges	
	MA	**FFS**	**MA**	**FFS**
Number of episodes	975,134	2,123,235	434,084	1,179,792
Demographic Characteristics				
Female	54.6%	56.5%	57.5%	59.8%
Age	77.0 (7.8)	78.7 (8.3)	78.6 (8.0)	80.3 (8.3)
Race				
White	65.7%	81.7%	67.0%	82.1%
Black	12.1%	7.2%	12.0%	7.6%
Hispanic	20.5%	9.7%	17.5%	8.9%
Asian/PI	0.5%	0.5%	0.4%	0.5%
Native American	0.1%	0.1%	0.1%	0.1%
Other	1.2%	0.9%	1.1%	0.9%
Clinical Characteristics				
Charlson comorbidity	2.0 (2.0)	2.1 (2.1)	2.2 (2.1)	2.2 (2.1)
Geriatric risk category**				
0	78.4%	71.6%	65.9%	59.9%
1	17.3%	21.5%	26.1%	29.1%
2+	4.3%	7.0%	8.1%	11.0%
Condition specific severity (of clinical cohort)				
Hemmorhagic	8.2%	7.9%	8.9%	8.4%
Morbid obesity	3.5%	3.0%	3.5%	3.0%
Acute HF	9.7%	11.1%	9.6%	10.7%
Socioeconomic Characteristics				
Unemployment rate	8.9%	9.0%	8.8%	9.0%
Poverty	16.7%	16.1%	16.5%	16.1%
Median household income				
1 (Poorest quartile)	30.3%	26.4%	29.3%	26.8%
2	29.4%	28.2%	29.9%	28.4%
3	22.9%	24.9%	23.0%	24.7%
4 (Wealthiest quartile)	17.5%	20.6%	17.8%	20.2%
SNF/1000 population	0.03 (0.02)	0.04 (0.02)	0.03 (0.02)	0.04 (0.02)
HHA/1000 population	0.09 (0.07)	0.07 (0.06)	0.09 (0.07)	0.07 (0.06)
Phys/1000 population	0.06 (0.06)	0.06 (0.07)	0.06 (0.06)	0.06 (0.07)

	All Discharges		Postacute Discharges	
	MA	**FFS**	**MA**	**FFS**
Number of episodes	975,134	2,123,235	434,084	1,179,792
% >65 years married	52.5%	54.9%	52.5%	54.7%
Metropolitan area	99.1%	96.7%	99.2%	97.2%
Outcome				
Discharge Home	55.5%	44.4%		
LOS of IP stay	4.7 (4.7)	5.4 (5.5)	6.5 (5.8)	6.9 (6.3)
Total Cost of IP stay	10,087 (10,900)	10,105 (10,822)	13,279 (13,790)	12,149 (12,587)
30-day Readmissions	14.9%	17.4%	18.2%	20.7%
Discharge to PAC				
SNF	20.0%	27.1%	44.9%	48.8%
HHA	22.4%	24.0%	50.4%	43.2%
IRF	1.6%	3.7%	3.7%	6.6%
LTCH	0.5%	0.8%	1.0%	1.4%

*All significant at the p<0.01 level.

Notes: Medicare discharges to home and postacute services in FL 2010-2014; excluded discharges in hospitals with <10 postacute discharges each year, discharge from patients who did not reside in Florida and who were less than 65 years of age. **Geriatric risk markers are from the Johns Hopkins ACG risk adjustment methodology.

Table 2.2: Association of comorbidity and geriatric risk on postacute utilization and outcomes in MA and FFS hospitalized patients (FL, 2010-2014)

	All discharges		Postacute discharges only					
	Discharge Home		IP LOS (days)		IP Cost ($)		Readmissions 30	
	MA	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	975,134	2,123,235	434,084	1,179,792	434,084	1,179,792	434,084	1,179,792
Charlson Comorbidity Index	-0.0228***	-0.0206***	0.548***	0.470***	747.3***	518.0***	0.0162***	0.0161***
	(0.000929)	(0.000840)	(0.0152)	(0.0121)	(48.02)	(36.05)	(0.000498)	(0.000427)
R^2	*0.07*	*0.093*	*0.126*	*0.239*	*0.103*	*0.105*	*0.017*	*0.024*
RMSE	*0.479*	*0.473*	*5.468*	*5.523*	*13066*	*11907*	*0.383*	*0.4*
Charlson Comorbidity Index	-0.0229***	-0.0208***	0.556***	0.478***	702.3***	519.4***	0.0162***	0.0162***
	(0.000990)	(0.000879)	(0.0152)	(0.0122)	(40.79)	(36.11)	(0.000503)	(0.000425)
Geriatric risk = 1	-0.257***	-0.241***	0.624***	0.643***	1,008***	608.1***	0.00812***	0.0184***
	(0.00352)	(0.00407)	(0.0625)	(0.0497)	(94.58)	(82.42)	(0.00196)	(0.00258)
Geriatric risk = 2+	-0.404***	-0.352***	1.254***	1.226***	1,892***	1,433***	0.00353	0.00766***
	(0.00502)	(0.00617)	(0.0826)	(0.0720)	(152.4)	(136.8)	(0.00237)	(0.00252)
Geriatric risk = 0 (ref)								
R^2	*0.125*	*0.149*	*0.131*	*0.244*	*0.102*	*0.106*	*0.017*	*0.025*
RMSE	*0.465*	*0.458*	*5.455*	*5.508*	*13070*	*11903*	*0.383*	*0.4*

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, sex, race/ethnicity) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviation key: inpatient length of stay (IP LOS), inpatient cost (IP Cost), root mean squared error (RMSE)

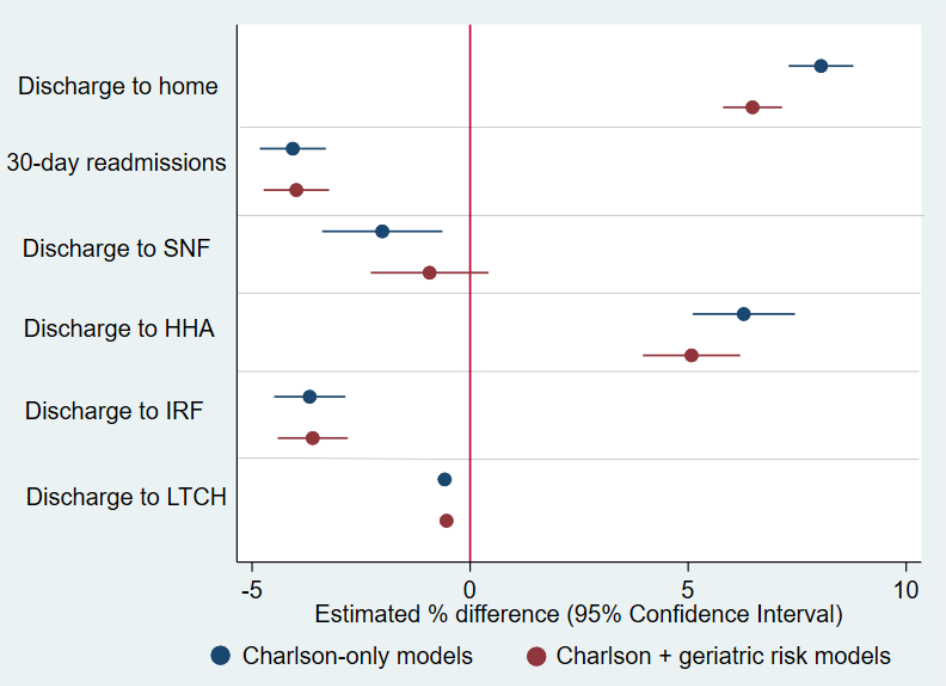
Table 2.3: Association of geriatric risk on postacute destination in MA and FFS hospitalized postacute users (FL, 2010-2014)

	Postacute facility destination			
	SNF		HHA	
	MA	FFS	MA	FFS
n	434,084	1,179,792	434,084	1,179,792
Charlson Comorbidity Index	-0.00110	6.24e-05	-0.000736	-0.00278***
	(0.000982)	(0.000772)	(0.00124)	(0.000862)
R^2	*0.054*	*0.079*	*0.046*	*0.069*
RMSE	*0.484*	*0.480*	*0.489*	*0.478*
Charlson Comorbidity Index	0.00104	0.00205***	-0.00303**	-0.00497***
	(0.000961)	(0.000764)	(0.00124)	(0.000825)
Geriatric risk = 1	0.190***	0.174***	-0.208***	-0.202***
	(0.00446)	(0.00460)	(0.00475)	(0.00407)
Geriatric risk = 2+	0.283***	0.259***	-0.301***	-0.281***
	(0.00582)	(0.00536)	(0.00579)	(0.00545)
Geriatric risk = 0 (ref)				
R^2	*0.094*	*0.116*	*0.092*	*0.116*
RMSE	*0.474*	*0.47*	*0.477*	*0.466*

	Postacute facility destination			
	IRF		LTCH	
	MA	FFS	MA	FFS
n	434,084	1,179,792	434,084	1,179,792
Charlson Comorbidity Index	-0.000575	0.000298	0.00241***	0.00242***
	(0.000566)	(0.000410)	(0.000282)	(0.000266)
R^2	*0.031*	*0.059*	*0.013*	*0.023*
RMSE	*0.185*	*0.241*	*0.1*	*0.117*
Charlson Comorbidity Index	-0.000482	0.000424	0.00248***	0.00250***
	(0.000571)	(0.000414)	(0.000290)	(0.000274)
Geriatric risk = 1	0.0125***	0.0228***	0.00556***	0.00577***
	(0.00168)	(0.00263)	(0.000842)	(0.000828)
Geriatric risk = 2+	0.00730***	0.00970***	0.0103***	0.0118***
	(0.00162)	(0.00245)	(0.00153)	(0.00144)
Geriatric risk = 0 (ref)				
R^2	*0.032*	*0.061*	*0.014*	*0.024*
RMSE	*0.185*	*0.241*	*0.1*	*0.117*

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, sex, race/ethnicity) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: skilled nursing facility (SNF), home health agency (HHA), inpatient rehabilitation facility (IRF), and long-term care hospital (LTCH), root mean squared error (RMSE)

Figure 2.1: Estimated differences in utilization and outcomes between Medicare Advantage vs. FFS Medicare hospitalized beneficiaries (FL, 2010-2014)



Notes. Differences higher than 0% indicate that MA discharges are more likely to experience outcome compared with FFS discharges. Differences in which the 95% CI does not cross 0% are statistically significant at the p<0.01 level. See Table 4 for more description.

Table 2.4: Estimated differences in utilization and outcomes between Medicare Advantage vs. FFS Medicare hospitalized beneficiaries (FL, 2010-2014)

	All discharges	Postacute discharges only						
	Discharge Home	**IP LOS (days)**	**IP Total Cost ($)**	**30-Day Readmissions**	**SNF**	**HHA**	**IRF**	**LTCH**
Medicare Advantage (vs. FFS)	0.0648***	-0.0402	584.7***	-0.0378***	-0.00930	0.0508***	-0.0361***	-0.00540***
	(0.00344)	(0.0516)	(82.47)	(0.00378)	(0.00686)	(0.00567)	(0.00408)	(0.000790)
n	3,098,369	1,613,876	1,613,876	1,613,876	1,613,876	1,613,876	1,613,876	1,613,876

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patient characteristics (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: inpatient length of stay (IP LOS); inpatient total cost (IP total cost); skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH).

Table 2.5: Estimated differences in utilization and outcome between Medicare Advantage vs. FFS Medicare hospitalized beneficiaries by clinical cohort (FL, 2010-2014)

	All discharges	Postacute discharges only						
Disease Specific Cohorts	**Discharge Home**	**IP LOS (days)**	**IP Total Cost ($)**	**30-Day Readmissions**	**SNF**	**HHA**	**IRF**	**LTCH**
Stroke								
MA (vs. FFS)	0.0195***	0.100	98.29	-0.103***	0.0897***	0.0382***	-0.126***	-0.00146
	(0.00512)	(0.0759)	(92.33)	(0.00984)	(0.0113)	(0.00579)	(0.0107)	(0.00100)
n	64,308	46,195	46,195	46,195	46,195	46,195	46,195	46,195
Joint Replacement								
MA (vs. FFS)	0.0110	0.0246	34.10	-0.0542***	0.0492***	0.0122	-0.0607***	-0.000681***
	(0.00769)	(0.0222)	(47.99)	(0.00848)	(0.0121)	(0.00814)	(0.00842)	(0.000203)
n	140,406	133,562	133,562	133,562	133,562	133,562	133,562	133,562
Congestive Heart Failure								
MA (vs. FFS)	0.0734***	-0.102	-139.7	-0.0239***	-0.0432***	0.0744***	-0.0249***	-0.00622***
	(0.00515)	(0.0730)	(98.04)	(0.00412)	(0.00825)	(0.00814)	(0.00383)	(0.00108)
n	145,609	79,232	79,232	79,232	79,232	79,232	79,232	79,232

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patient characteristics (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: inpatient length of stay (IP LOS); inpatient total cost (IP total cost); skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH).

Appendix Table 2.1: Geriatric risk concepts present in Medicare cohort, (FL 2010-2014)

	MA	FFS	Total
n	975,134	2,123,235	3,098,369
Fall	9.1%	10.5%	10.1%
Difficulty Walking	2.8%	4.1%	3.7%
Dementia	8.0%	11.8%	10.6%
Malnutrition	0.8%	1.4%	1.2%
Weight Loss	3.1%	4.3%	4.0%
Vision Problems	0.6%	0.8%	0.7%
Pressure ulcers	2.0%	3.4%	2.9%
Urinary Incontinence	0.1%	0.1%	0.1%
Fecal Incontinence	0.1%	0.2%	0.2%
Social support issues	0.1%	0.1%	0.1%

Notes: Medicare discharges to home and postacute services in FL 2010-2014; excluded discharges in hospitals with <10 postacute discharges each year, discharge from patients who did not reside in Florida and who were less than 65 years of age. Geriatric risk markers are from the Johns Hopkins ACG risk adjustment methodology.

Appendix Table 2.2: Geriatric risk count in Medicare cohort, (FL 2010-2014)

	MA		FFS		Total	
	n	%	n	%	n	%
0	764,237	78.4%	1,520,043	71.6%	2,284,280	73.7%
1	169,057	17.3%	455,603	21.5%	624,660	20.2%
2	35,681	3.7%	122,311	5.8%	157,992	5.1%
3	5,480	0.6%	22,372	1.1%	27,852	0.9%
4	630	0.1%	2,685	0.1%	3,315	0.1%
5	47	0.0%	209	0.0%	256	0.0%
6	2	0.0%	12	0.0%	14	0.0%

Notes: Medicare discharges to home and postacute services in FL 2010-2014; excluded discharges in hospitals with <10 postacute discharges each year, discharge from patients who did not reside in Florida and who were less than 65 years of age. Geriatric risk markers are from the Johns Hopkins ACG risk adjustment methodology.

Appendix Table 2.3: Association of comorbidity and geriatric risk on postacute utilization and outcomes in disease specific cohorts of MA and FFS hospitalized patients (FL, 2010-2014)

	All discharges		Postacute discharges only					
Stroke	**Discharge Home**		**IP LOS (days)**		**IP Cost ($)**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	22,276	42,032	15,416	30,779	15,416	30,779	15,416	30,779
Charlson Comorbidity Index	-0.0514***	-0.0460***	0.425***	0.394***	736.9***	639.3***	0.0151***	0.0150***
	(0.00177)	(0.00137)	(0.0238)	(0.0158)	(55.40)	(36.42)	(0.00198)	(0.00171)
R^2	*0.107*	*0.113*	*0.124*	*0.148*	*0.188*	*0.206*	*0.053*	*0.099*
RMSE	*0.438*	*0.418*	*3.913*	*3.648*	*6656*	*6073*	*0.408*	*0.441*
Charlson Comorbidity Index	-0.0508***	-0.0457***	0.428***	0.397***	737.9***	639.7***	0.0150***	0.0148***
	(0.00180)	(0.00137)	(0.0236)	(0.0157)	(54.94)	(36.30)	(0.00199)	(0.00171)
Geriatric risk = 1	-0.131***	-0.130***	0.312***	0.224***	122.3	-74.45	-0.00601	-0.0206***
	(0.00646)	(0.00473)	(0.0797)	(0.0568)	(154.9)	(80.63)	(0.00741)	(0.00616)
Geriatric risk = 2+	-0.201***	-0.190***	0.681***	0.695***	313.1	385.4**	-0.0176	-0.0515***
	(0.0122)	(0.00652)	(0.146)	(0.0989)	(238.7)	(170.9)	(0.0128)	(0.0117)
Geriatric risk = 0 (ref)								
R^2	*0.125*	*0.135*	*0.125*	*0.15*	*0.187*	*0.206*	*0.053*	*0.1*
RMSE	*0.433*	*0.413*	*3.909*	*3.643*	*6656*	*6072*	*0.408*	*0.44*

	All discharges		Postacute discharges only					
Joint Replacement	**Discharge Home**		**IP LOS (days)**		**IP Cost ($)**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	43,340	97,066	41,021	92,541	41,021	92,541	41,021	92,541
Charlson Comorbidity Index	-0.00618***	-0.00539***	0.389***	0.435***	686.6***	762.8***	0.0152***	0.0273***
	(0.00133)	(0.00105)	(0.0184)	(0.0156)	(40.80)	(35.25)	(0.00173)	(0.00172)
R^2	*0.139*	*0.158*	*0.146*	*0.18*	*0.359*	*0.35*	*0.082*	*0.114*
RMSE	*0.209*	*0.194*	*2.009*	*1.981*	*4081*	*4007*	*0.294*	*0.321*
Charlson Comorbidity Index	-0.00551***	-0.00471***	0.324***	0.350***	635.8***	696.9***	0.0132***	0.0217***
	(0.00122)	(0.000962)	(0.0165)	(0.0138)	(37.93)	(32.13)	(0.00179)	(0.00142)
Geriatric risk = 1	-0.0195***	-0.0144***	1.724***	1.698***	1,346***	1,304***	0.0554***	0.135***
	(0.00475)	(0.00266)	(0.0509)	(0.0584)	(150.1)	(151.6)	(0.00625)	(0.0132)
Geriatric risk = 2+	-0.0190***	-0.0164***	2.423***	2.368***	1,979***	1,885***	0.0568***	0.0892***
	(0.00561)	(0.00418)	(0.119)	(0.0898)	(290.5)	(210.0)	(0.00892)	(0.00940)
Geriatric risk = 0 (ref)								
R^2	*0.136*	*0.158*	*0.231*	*0.27*	*0.369*	*0.36*	*0.086*	*0.13*
RMSE	*0.21*	*0.194*	*1.906*	*1.868*	*4051*	*3974*	*0.294*	*0.319*

	All discharges		Postacute discharges only					
Heart Failure	**Discharge Home**		**IP LOS (days)**		**IP Cost ($)**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	43,855	101,754	20,599	58,633	20,599	58,633	20,599	58,633
Charlson Comorbidity Index	-0.0293***	-0.0272***	0.363***	0.354***	601.3***	521.6***	0.0110***	0.0121***
	(0.00151)	(0.000942)	(0.0195)	(0.0141)	(41.10)	(25.43)	(0.00165)	(0.00116)
R^2	*0.087*	*0.086*	*0.089*	*0.081*	*0.181*	*0.177*	*0.02*	*0.02*
RMSE	*0.478*	*0.473*	*3.97*	*4.042*	*6306*	*5648*	*0.42*	*0.425*
Charlson Comorbidity Index	-0.0280***	-0.0265***	0.363***	0.356***	600.5***	524.5***	0.0110***	0.0121***
	(0.00148)	(0.000913)	(0.0197)	(0.0139)	(40.72)	(25.32)	(0.00164)	(0.00116)
Geriatric risk = 1	-0.204***	-0.198***	0.813***	0.613***	1,139***	876.7***	0.00931	-0.000311
	(0.00670)	(0.00539)	(0.0774)	(0.0544)	(129.7)	(85.89)	(0.00831)	(0.00479)
Geriatric risk = 2+	-0.322***	-0.295***	1.541***	1.278***	2,262***	1,725***	-0.0193	-0.000557
	(0.0150)	(0.00859)	(0.241)	(0.129)	(388.3)	(188.3)	(0.0164)	(0.00817)
Geriatric risk = 0 (ref)								
R^2	*0.11*	*0.116*	*0.098*	*0.088*	*0.187*	*0.183*	*0.019*	*0.02*
RMSE	*0.472*	*0.465*	*3.951*	*4.027*	*6280*	*5627*	*0.421*	*0.425*

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patient characteristics (age, race, gender) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: inpatient length of stay (IP LOS), inpatient total cost (IP total cost), root mean squared error (RMSE)

Appendix Table 2.4: Association of comorbidity and geriatric risk on postacute destination in disease specific cohorts of MA and FFS hospitalized postacute users (FL, 2010-2014)

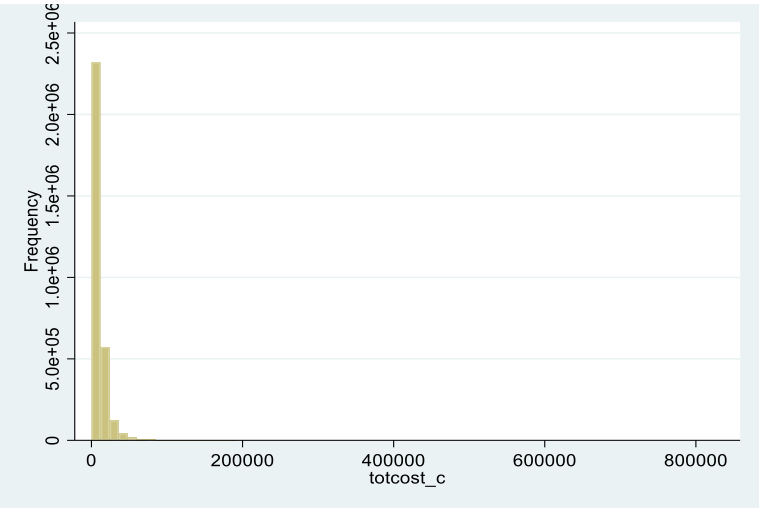
	SNF		HHA		IRF		LTCH	
Stroke	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	**15,416**	**30,779**	**15,416**	**30,779**	**15,416**	**30,779**	**15,416**	**30,779**
Charlson Comorbidity Index	0.0260***	0.0135***	-0.0361***	-0.0251***	0.00874***	0.0101***	0.00137***	0.00151***
	(0.00233)	(0.00148)	(0.00222)	(0.00158)	(0.00182)	(0.00158)	(0.000395)	(0.000375)
R^2	*0.079*	*0.122*	*0.051*	*0.037*	*0.087*	*0.144*	*0.018*	*0.025*
RMSE	*0.481*	*0.47*	*0.454*	*0.429*	*0.334*	*0.404*	*0.075*	*0.082*
Charlson Comorbidity Index	0.0267***	0.0147***	-0.0367***	-0.0259***	0.00861***	0.00964***	0.00138***	0.00155***
	(0.00237)	(0.00144)	(0.00221)	(0.00158)	(0.00184)	(0.00157)	(0.000394)	(0.000378)
Geriatric risk = 1	0.0821***	0.115***	-0.0682***	-0.0805***	-0.0149**	-0.0380***	0.000955	0.00375**
	(0.00947)	(0.00717)	(0.00883)	(0.00591)	(0.00727)	(0.00658)	(0.00132)	(0.00157)
Geriatric risk = 2+	0.140***	0.180***	-0.119***	-0.110***	-0.0264**	-0.0767***	0.00465	0.00607***
	(0.0164)	(0.0115)	(0.0146)	(0.00867)	(0.0107)	(0.0100)	(0.00407)	(0.00212)
Geriatric risk = 0 (ref)								
R^2	*0.086*	*0.138*	*0.056*	*0.046*	*0.086*	*0.147*	*0.018*	*0.026*
RMSE	*0.479*	*0.465*	*0.452*	*0.427*	*0.334*	*0.403*	*0.075*	*0.083*

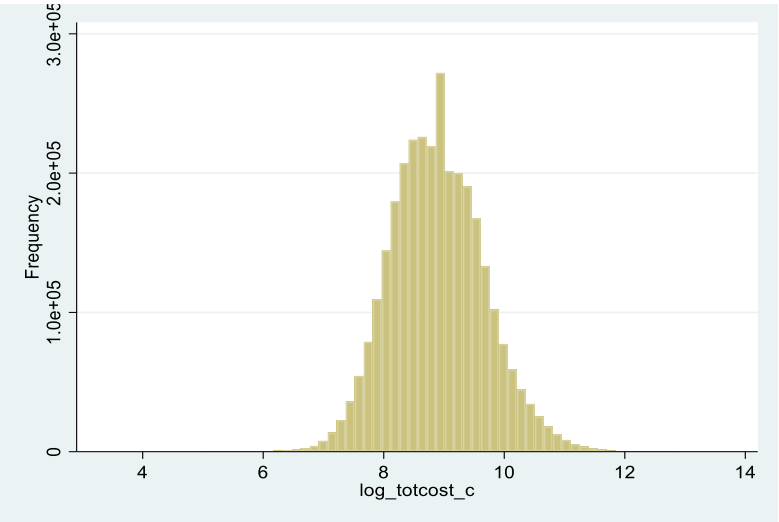
	SNF		HHA		IRF		LTCH	
Joint Replacement	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	**41,021**	**92,541**	**41,021**	**92,541**	**41,021**	**92,541**	**41,021**	**92,541**
Charlson Comorbidity Index	0.0361***	0.0298***	-0.0389***	-0.0487***	0.00253	0.0176***	0.000295**	0.00123***
	(0.00259)	(0.00251)	(0.00289)	(0.00175)	(0.00158)	(0.00215)	(0.000119)	(0.000293)
R^2	*0.214*	*0.192*	*0.283*	*0.25*	*0.143*	*0.179*	*0.004*	*0.013*
RMSE	*0.44*	*0.45*	*0.407*	*0.424*	*0.233*	*0.265*	*0.019*	*0.038*
Charlson Comorbidity Index	0.0305***	0.0248***	-0.0323***	-0.0388***	0.00161	0.0130***	0.000251**	0.00101***
	(0.00234)	(0.00202)	(0.00254)	(0.00144)	(0.00159)	(0.00171)	(0.000104)	(0.000241)
Geriatric risk = 1	0.155***	0.0929***	-0.184***	-0.217***	0.0282***	0.119***	0.00120**	0.00475*
	(0.0143)	(0.0181)	(0.0142)	(0.0132)	(0.00530)	(0.0142)	(0.000553)	(0.00274)
Geriatric risk = 2+	0.192***	0.172***	-0.209***	-0.226***	0.0146**	0.0488***	0.00163	0.00563***
	(0.0154)	(0.0168)	(0.0162)	(0.0158)	(0.00723)	(0.00984)	(0.00109)	(0.00130)
Geriatric risk = 0 (ref)								
R^2	*0.224*	*0.199*	*0.298*	*0.274*	*0.144*	*0.196*	*0.005*	*0.015*
RMSE	*0.437*	*0.448*	*0.403*	*0.417*	*0.233*	*0.262*	*0.019*	*0.038*

	SNF		HHA		IRF		LTCH	
Heart Failure	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**	**MA**	**FFS**
n	**20,599**	**58,633**	**20,599**	**58,633**	**20,599**	**58,633**	**20,599**	**58,633**
Charlson Comorbidity Index	0.00841***	0.00831***	-0.0104***	-0.0104***	0.000750	0.000520	0.00122***	0.00157***
	(0.00220)	(0.00130)	(0.00221)	(0.00140)	(0.000465)	(0.000518)	(0.000330)	(0.000359)
R^2	*0.064*	*0.058*	*0.063*	*0.053*	*0.025*	*0.06*	*0.015*	*0.027*
RMSE	*0.464*	*0.482*	*0.469*	*0.487*	*0.112*	*0.18*	*0.074*	*0.1*
Charlson Comorbidity Index	0.00830***	0.00886***	-0.0103***	-0.0110***	0.000745	0.000532	0.00121***	0.00159***
	(0.00218)	(0.00128)	(0.00219)	(0.00136)	(0.000464)	(0.000517)	(0.000330)	(0.000360)
Geriatric risk = 1	0.155***	0.186***	-0.166***	-0.195***	0.00598**	0.00447**	0.00522***	0.00484***
	(0.0100)	(0.00596)	(0.0104)	(0.00587)	(0.00234)	(0.00226)	(0.00181)	(0.00125)
Geriatric risk = 2+	0.282***	0.283***	-0.300***	-0.297***	0.00696	0.00460	0.0107**	0.00958***
	(0.0207)	(0.0105)	(0.0205)	(0.00993)	(0.00553)	(0.00496)	(0.00467)	(0.00247)
Geriatric risk = 0 (ref)								
R^2	*0.087*	*0.092*	*0.089*	*0.09*	*0.025*	*0.06*	*0.015*	*0.027*
RMSE	*0.458*	*0.474*	*0.463*	*0.478*	*0.112*	*0.18*	*0.075*	*0.0999*

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, sex, race/ethnicity) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviation key: skilled nursing facility (SNF), home health agency (HHA), inpatient rehabilitation facility (IRF), long-term care hospital (LTCH), root mean squared error (RMSE)

Appendix Figure 2.1: Distribution of inpatient hospital spending (untransformed and logged) by Medicare beneficiaries (FL, 2010-2014)





Appendix Table 2.5: Association of geriatric risk on log inpatient costs of MA and FFS hospitalized patients using postacute (FL, 2010-2014)

	Postacute discharges only							
	All disease cohorts		Stroke		Joint Replacement		Heart Failure	
	MA	FFS	MA	FFS	MA	FFS	MA	FFS
n	434,084	1,179,792	15,416	30,779	41,021	92,541	20,599	58,633
Charlson Comorbidity Index	0.0581***	0.0450***	0.0714***	0.0671***	0.0386***	0.0429***	0.0720***	0.0676***
	(0.00273)	(0.00230)	(0.00277)	(0.00173)	(0.00183)	(0.00160)	(0.00237)	(0.00181)
R^2	*0.109*	*0.107*	*0.252*	*0.261*	*0.499*	*0.453*	*0.226*	*0.209*
RMSE	*0.741*	*0.733*	*0.147*	*0.478*	*0.213*	*0.215*	*0.531*	*0.531*
Charlson Comorbidity Index	0.0581***	0.0451***	0.0711***	0.0670***	0.0356***	0.0390***	0.0708***	0.0670***
	(0.00276)	(0.00231)	(0.00277)	(0.00174)	(0.00168)	(0.00139)	(0.00239)	(0.00177)
Geriatric risk = 1	0.0983***	0.0693***	0.0508***	0.0322***	0.0833***	0.0765***	0.182***	0.173***
	(0.00655)	(0.00591)	(0.00894)	(0.00652)	(0.00960)	(0.00968)	(0.00856)	(0.00557)
Geriatric risk = 2+	0.199***	0.159***	0.0920***	0.0832***	0.119***	0.110***	0.324***	0.286***
	(0.0118)	(0.00958)	(0.0142)	(0.0115)	(0.0163)	(0.0129)	(0.0205)	(0.0117)
Geriatric risk = 0 (ref)								
R^2	*0.135*	*0.139*	*0.253*	*0.261*	*0.509*	*0.463*	*0.234*	*0.216*
RMSE	*0.717*	*0.697*	*0.478*	*0.478*	*0.211*	*0.212*	*0.529*	*0.529*

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, sex, race/ethnicity) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

Appendix Table 2.6: Estimated differences in inpatient stay log cost between Medicare Advantage vs. FFS Medicare hospitalized beneficiaries (FL, 2010-2014)

	Postacute discharges only
Log Inpatient Costs	
Medicare Advantage (vs. FFS)	0.0379***
	(0.00623)
n	1,613,876

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

Appendix Table 2.7: Association of geriatric risk on readmissions in MA and FFS hospitalized patients by discharge destination (FL, 2010-2014)

	Discharge to home	
	MA	**FFS**
n	541,050	943,443
Charlson Comorbidity Index	0.0176***	0.0174***
	(0.000540)	(0.000503)
Geriatric risk = 1	0.0125***	0.0148***
	(0.00172)	(0.00131)
Geriatric risk = 2+	0.0129***	0.0184***
	(0.00428)	(0.00296)
Geriatric risk = 0 (ref)		

	Discharge to SNF	
	MA	**FFS**
n	194,857	575,656
Charlson Comorbidity Index	0.0160***	0.0145***
	(0.000637)	(0.000398)
Geriatric risk = 1	-0.00677***	-0.00487***
	(0.00231)	(0.00146)
Geriatric risk = 2+	-0.0105***	-0.0119***
	(0.00264)	(0.00200)
Geriatric risk = 0 (ref)		

	Discharge to HHA	
	MA	**FFS**
n	218,830	509,349
Charlson Comorbidity Index	0.0176***	0.0188***
	(0.000464)	(0.000413)
Geriatric risk = 1	0.00866***	0.0114***
	(0.00241)	(0.00167)
Geriatric risk = 2+	0.0152***	0.0223***
	(0.00433)	(0.00308)
Geriatric risk = 0 (ref)		

	Discharge to IRF	
	MA	**FFS**
n	15,934	77,948
Charlson Comorbidity Index	0.00766***	-0.00141
	(0.00259)	(0.00152)
Geriatric risk = 1	-0.00432	-0.00133
	(0.00958)	(0.00437)
Geriatric risk = 2+	-0.0242*	-0.0326***
	(0.0146)	(0.00718)
Geriatric risk = 0 (ref)		

	Discharge to LTCH	
	MA	**FFS**
n	4,463	16,839
Charlson Comorbidity Index	-0.00796***	-0.0148***
	(0.00292)	(0.00156)
Geriatric risk = 1	-0.00627	-0.0279***
	(0.0157)	(0.0101)
Geriatric risk = 2+	-0.0371	-0.0574***
	(0.0248)	(0.0138)
Geriatric risk = 0 (ref)		

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

Appendix Table 2.8: Estimated differences between Medicare Advantage vs. FFS Medicare in probability of 30-day readmissions by discharge destination (FL, 2010-2014)

	Discharges to home	Discharges to SNF	Discharges to HHA	Discharges to IRF	Discharges to LTCH
30 Day Readmissions					
MA (vs. FFS)	-0.0102***	-0.0121***	-0.00900***	-0.141***	-0.160***
	(0.00101)	(0.00208)	(0.00145)	(0.0218)	(0.0160)
n	1,484,493	770,513	728,179	93,882	21,302

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, race, gender, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

Appendix Table 2.9: Estimated relative risk ratios of geriatric risk on postacute destination in MA and FFS hospitalized postacute users using multinomial logit models (FL, 2010-2014)

	Postacute discharges	
	MA	FFS
n	434,084	1,179,792
SNF		
Geriatric risk = 1	2.378***	2.393***
	(0.0520)	(0.0579)
Geriatric risk = 2+	3.711***	3.761***
	(0.1191)	(0.1608)
Geriatric risk = 0 (ref)		
IRF		
Geriatric risk = 1	2.141***	2.257***
	(0.1054)	(0.0732)
Geriatric risk = 2+	2.657***	2.634***
	(0.1712)	(0.145)
Geriatric risk = 0 (ref)		
LTCH		
Geriatric risk = 1	2.544***	2.512***
	(0.1575)	(0.1095)
Geriatric risk = 2+	4.892***	4.722***
	(0.3538)	(0.2983)
Geriatric risk = 0 (ref)		
HHA (base)		

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patients' demographic and clinical information (age, sex, race/ethnicity, Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Year fixed effects and robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: skilled nursing facility (SNF), home health agency (HHA), inpatient rehabilitation facility (IRF), and long-term care hospital (LTCH). Base category is HHA and geriatric reference group is non-risk; interpretations are relative risk ratios.

Appendix Table 2.10: Estimated relative risk ratios in postacute destinations between Medicare Advantage vs. FFS Medicare hospitalized beneficiaries using multinomial logit models (FL, 2010-2014)

	Postacute discharges
n	1,613,876
SNF	
MA (vs. FFS)	0.8961***
	(0.0288)
IRF	
MA (vs. FFS)	0.4538***
	(0.0316)
LTCH	
MA (vs. FFS)	0.5833***
	(0.0422)
HHA (base)	

Notes: Medicare discharges to postacute services in Florida during 2010-2014. All models adjusted for patient characteristics (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1. Abbreviations key: inpatient length of stay (IP LOS); inpatient total cost (IP total cost); skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH). Base category is HHA and reference group is fee-for-service Medicare discharges; interpretations are relative risk ratios.

Appendix Table 2.11: Estimated odds ratios on discharge home and 30 day readmissions between MA and FFS Medicare hospitalized beneficiaries (FL, 2010-2014)

All disease cohorts	**Discharge Home**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**
n	973,857	2,121,890	434,079	1,179,774
Charlson Comorbidity Index	0.906***	0.912***	1.105***	1.097***
	(0.00370)	(0.00348)	(0.00399)	(0.00321)
C-statistic	*0.65*	*0.674*	*0.599*	*0.611*
Charlson Comorbidity Index	0.901***	0.907***	1.106***	1.097***
	(0.00414)	(0.00391)	(0.00402)	(0.00319)
Geriatric risk = 1	0.329***	0.326***	1.055***	1.119***
	(0.00563)	(0.00550)	(0.0139)	(0.0167)
Geriatric risk = 2+	0.138***	0.140***	1.021	1.045***
	(0.00433)	(0.00470)	(0.0170)	(0.0164)
Geriatric risk = 0 (ref)				
C-statistic	*0.698*	*0.725*	*0.6*	*0.612*

Stroke	**Discharge Home**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**
n	22,275	42,032	15,354	30,765
Charlson Comorbidity Index	0.735***	0.738***	1.091***	1.079***
	(0.00883)	(0.00782)	(0.0113)	(0.00927)
C-statistic	*0.709*	*0.723*	*0.656*	*0.696*
Charlson Comorbidity Index	0.733***	0.736***	1.091***	1.078***
	(0.00911)	(0.00785)	(0.0113)	(0.00927)
Geriatric risk = 1	0.471***	0.444***	0.962	0.898***
	(0.0183)	(0.0151)	(0.0435)	(0.0280)
Geriatric risk = 2+	0.234***	0.225***	0.893	0.759***
	(0.0271)	(0.0174)	(0.0731)	(0.0450)
Geriatric risk = 0 (ref)				
C-statistic	*0.728*	*0.744*	*0.656*	*0.697*

Joint Replacement	**Discharge Home**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**
n	42,801	94,741	40,994	92,541
Charlson Comorbidity Index	0.844***	0.838***	1.163***	1.231***
	(0.0222)	(0.0174)	(0.0225)	(0.0128)
C-statistic	*0.815*	*0.836*	*0.728*	*0.738*
Charlson Comorbidity Index	0.860***	0.859***	1.140***	1.180***
	(0.0218)	(0.0175)	(0.0223)	(0.0109)
Geriatric risk = 1	0.478***	0.463***	1.721***	2.719***
	(0.0678)	(0.0450)	(0.0900)	(0.204)
Geriatric risk = 2+	0.448***	0.358***	1.705***	2.021***
	(0.116)	(0.0875)	(0.138)	(0.134)
Geriatric risk = 0 (ref)				
C-statistic	*0.817*	*0.839*	*0.734*	*0.755*

Heart Failure	**Discharge Home**		**Readmissions 30**	
	MA	**FFS**	**MA**	**FFS**
n	43,837	101,742	20,586	58,633
Charlson Comorbidity Index	0.879***	0.885***	1.063***	1.067***
	(0.00589)	(0.00388)	(0.00940)	(0.00635)
C-statistic	*0.67*	*0.671*	*0.593*	*0.593*
Charlson Comorbidity Index	0.882***	0.885***	1.063***	1.067***
	(0.00597)	(0.00390)	(0.00938)	(0.00634)
Geriatric risk = 1	0.403***	0.383***	1.054	0.998
	(0.0122)	(0.0103)	(0.0499)	(0.0268)
Geriatric risk = 2+	0.204***	0.184***	0.887	0.995
	(0.0196)	(0.0110)	(0.0914)	(0.0465)
Geriatric risk = 0 (ref)				
C-statistic	*0.692*	*0.701*	*0.594*	*0.593*

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patients' demographic information (age, sex, race/ethnicity) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

Appendix Table 2.12: Estimated odds ratios in discharge home and 30-day readmissions of Medicare hospitalized beneficiaries (FL, 2010-2014)

	All disease cohorts		Stroke		Joint Replacement		Heart Failure	
	Discharge Home	**30-Day Readmissions**	**Discharge Home**	**30-Day Readmissions**	**Discharge Home**	**30-Day Readmissions**	**Discharge Home**	**30-Day Readmissions**
MA (vs. FFS)	1.345***	0.784***	1.121***	0.568***	1.332	0.561***	1.392***	0.877***
	(0.0216)	(0.0183)	(0.0314)	(0.0273)	(0.233)	(0.0480)	(0.0322)	(0.0201)
n	3,096,543	1,613,857	64,308	46,183	140,077	133,562	145,594	79,232

Notes: Medicare discharges to home and postacute services in Florida during 2010-2014. All models adjusted for patient characteristics (age, race, gender, geriatric risk categories, condition specific severity & Charlson comorbidity index) and patients' county of residence information (poverty, median income, unemployment, married, metropolitan status, # of SNFs/HHA/physicians per 1000 residents). Hospital-level and year fixed effects, robust SE clustered at hospital level. *** p<0.01, **p<0.05, * p<0.1.

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CHAPTER THREE

THE EFFECT OF MEDICARE ADVANTAGE ENROLLMENT ON POSTACUTE CARE UTILIZATION OF HOSPITALIZED MEDICARE BENEFICIARIES

Abstract

Background: Medicare Advantage (MA) has seen sharp increases in enrollment during the past decade and its enrollment is projected to grow even further as premiums continue to decline and benefits continue to expand. Previous research has demonstrated that increased enrollment in MA plans in a geographic area decreases the average rate of inpatient and outpatient health care spending and utilization incurred by fee-for-service (FFS) beneficiaries in that same region. This suggests that there are significant positive spillover effects of MA. To date, little research has examined the potential impact of MA enrollment on postacute care service in an area, despite the fact that differences in postacute care patterns are known to be a key driver of geographic variation in per capita FFS spending.

Methods: Hospital discharge abstract data from Florida from 2010 to 2014, along with Area Health Resource File, Dartmouth Atlas Medicare Spending files, and enrollment/payment data from CMS Medicare Rate Books are used for this study. Variation in MA county-level payment rates—an exogenous policy shock that influences MA enrollment—are used to test for effects in utilization and outcomes in Medicare postacute utilization; then separately within the FFS and MA cohorts.

Results: Conditional on admission to the hospital and postacute use, there are no statistically significant relationships between MA enrollment on postacute use in Medicare. However, the direction of the estimates suggests that an increase in MA

enrollment led to increased use of skilled nursing and decreased use of home health across MA and FFS discharges. There were also no significant relationships, though the direction of effects remains robust, on postacute use and MA enrollment among all hospitalized patients not conditional on postacute discharge.

Conclusion: These findings suggest that MA enrollment has little to no effect on postacute destinations in the overall Medicare market, at least in this large state with both high rates of MA enrollment and high payment rates. Further payment policy changes to the MA program should not only monitor inpatient utilization and outcome but other types of utilization, access, and quality.

Introduction

Medicare Advantage (MA) has seen sharp increases in enrollment during the past decade and its enrollment is projected to grow even further as premiums continue to decline and benefits continue to expand (Center for Medicare and Medicaid Services [CMS], 2018). Currently, one in three Medicare beneficiaries is enrolled in these private managed care plans (Kaiser Family Foundation [KFF], 2017). Concurrently, postacute care services have been increasing among Medicare populations (Burke et al., 2015; Chandra, Dalton, & Holmes, 2013). Postacute care services represent rehabilitation services provided to Medicare beneficiaries after an acute (short term) hospital stay. Postacute services include care provided in skilled nursing facilities (SNFs), home health agencies (HHAs), inpatient rehabilitation facilities (IRFs), and long-term care hospitals (LTCHs). In 2013, 40% of all hospitalized fee-for-service (FFS) Medicare patients utilized postacute service after their inpatient stay (Tian, 2016).

There is limited understanding on what the impact of MA enrollment is on postacute services in a region. Three studies have examined differential use between MA and FFS on postacute services and find that MA enrollees tend to utilize less postacute and at lower intensity (Huckfeldt, Escarce, Rabideau, Karaca-Mandic, & Sood, 2017; Kumar et al., 2018; Waxman et al., 2016). However, other research demonstrates that high cost patients (i.e. long-term, short-term nursing home care, and home health care users) enrolled in these private plans have an increased rate of leaving MA and joining FFS Medicare (Goldberg, Trivedi, Mor, Jung, & Rahman, 2017; Meyers et al., 2019; Rahman, Keohane, Trivedi, & Mor, 2015).

Literature in the inpatient and outpatient setting examining differential use between MA and FFS enrollees is mixed, mainly due to the concern of bias selection of healthier beneficiaries into MA. Some of the literature finds that MA patients utilize less intensive services and experience better outcomes (Basu & Mobley, 2007, 2012; Lemieux, Sennett, Wang, Mulligan, & Bumbaugh, 2012; Nicholas, 2013). Others find that controlling for self-selection into these plans to the extent feasible, MA patients experience higher readmission rates than FFS (Friedman, Jiang, Steiner, & Bott, 2012). Analogously, differences in postacute utilization between MA and FFS may be attributed to different care practices or to the characteristics of the population served by each program.

If there are underlying differences in care received by MA and FFS patients, as suggested by some of the literature, MA enrollment could also impact postacute service utilization and quality in a number of direct and indirect ways. A market where there is higher MA enrollment would mean more providers work under contract to MA plans. These providers would also serve patients in other plans, potentially inducing spillover effects. For example, MA induced delivery practices might find their way into the broader Medicare market, given that most MA physicians also serve FFS enrollees.

To date, research estimating spillover effects of increased managed care penetration on overall utilization and spending among FFS Medicare beneficiaries has focused on hospital utilization and spending. This research has demonstrated positive spillover effects of MA enrollment on FFS Medicare; that is, increased enrollment of beneficiaries in a region into MA decreases the average cost and utilization of services by those Medicare patients in the region remaining in traditional FFS Medicare (Baicker,

Chernew, & Robbins, 2013; Baker, 1997, 1999, 2003; Bundorf et al., 2004; Chernew, Decicca, & Town, 2008; Robinson, 1996). No such studies have been undertaken to assess whether there are similar effects on postacute care services.

We expand on previous literature that focusses on the intersection between Medicare Advantage and postacute care by examining the effect of MA enrollment on postacute utilization in the overall (including both MA and FFS) Medicare market and then separately within the FFS and MA beneficiary sub-groups. We exploited Medicare Advantage payment policy updates to account for the potentially confounding effects of MA enrollment and healthcare utilization and outcomes. By assessing whether MA enrollment has an impact on Medicare postacute care sector, our goal is to gain information that could potentially be relevant to policymakers, clinicians, and managers to more effectively design programs to meet the needs of the growing group of Medicare beneficiaries utilizing post-hospital care.

Background

Postacute utilization and outcomes in Medicare Advantage

Medicare Advantage plans have greater flexibility in providing postacute services compared to fee-for-service Medicare providers. For example, MA plans have more discretion over cost-sharing levels. MA plans have also been found to use a preferred network of postacute providers for its enrollees (Meyers et al., 2018), and 71% of enrollees need prior authorization for skilled nursing stays and 62% for home health services (KFF, 2018; Meyers, Mor, & Rahman, 2018; Rahman, Meyers, & Mor, 2018). FFS Medicare skilled nursing facility (SNF) services are covered only after a three-day

inpatient hospital stay and covered for 20 days without cost-sharing, but some MA plans have chosen to waive the three-day hospital stay rule. Several studies have examined how benefit design in MA plans impact postacute care received by its enrollees. One study finds that there is no increase in use of hospital and SNF services among those enrollees who are covered in plans that eliminated three-day rule compared to plans that did not (Grebla et al., 2015). This suggests that a three-day requirement may be contributing to unwarranted additional inpatient spending and utilization. Other MA plans have instituted first-dollar cost-sharing for SNF and research finds that there is a significant reduction in the use of SNFs with no offsets in increased hospital use (Keohane et al., 2017). However, disenrollment rates are higher in plans that introduced first-dollar SNF cost-sharing than in plans that did not. In home health (HH) services, traditional Medicare benefit is provided at no cost to the patient under the requirements that patients be homebound and assessed in a face-to-face encounter for every 60-day episode. Enrollees in MA plans that instituted cost-sharing have no difference in home health utilization, but disenrollment from MA is again higher in these plans (Li, Keohane, Thomas, Lee, & Trivedi, 2017).

Nationally, differences in utilization and outcomes in postacute care for Medicare beneficiaries has been documented across coverage type. Three studies that examine postacute utilization and outcomes in Medicare Advantage all conclude that MA plans manage their patients more tightly—MA enrollees use less intense postacute care and suffer no worse outcomes than FFS patients (Huckfeldt et al., 2017; Kumar et al., 2018; Waxman et al., 2016). In these studies, patient demographic, clinical, and socioeconomic factors are adjusted to compare utilization and quality of postacute care between MA and

FFS patients. For example, Huckfeldt et al. (2017) control for diagnoses-based clinical characteristics (i.e. Elixhauser and condition-specific severity measures), dual eligible status, and Part D low-income subsidy status for cohorts of joint replacement, stroke, and heart failure discharges to SNF and IRF from hospitals receiving payments for Disproportionate Share Hospital (DSH) programs. They find that MA patients are less likely to be admitted to IRFs and have shorter lengths of stay in SNFs than FFS patients, while finding no differences in observable patient characteristics between the two MA and FFS cohorts. Both Kumar et al. (2018) and Waxman et al. (2016) find MA patients utilize less rehabilitation and home health use and are more likely to be discharged to the community. These findings suggest that MA plans may be delivering postacute care differently than FFS and enrollees suffer no worse outcomes.

Medicare Advantage spillover literature

There is strong evidence of Medicare managed care spillover effects impacting FFS care in inpatient and outpatient settings (Baicker et al., 2013; Chernew et al., 2008). Managed care practice styles may influence how providers care for all their patients. For example, managed care organizations employ a number of techniques to control utilization such as utilization review, prior authorization, restricted networks, and higher cost sharing. There is evidence that providers make decisions based on their overall mix of patients so that a change on the average can affect others (Newhouse & Marquis, 1978).

These mechanisms have motivated several papers to explore spillover effects of managed care on the broader healthcare market. Baicker et al. (2013) explore the

relationship of MA enrollment on hospitalizations and lengths of stay in Medicare and commercial markets. They find that greater Medicare managed care penetration is not associated with fewer hospitalizations, but is associated with lower costs and shorter stays per hospitalization. A 10% increase in MA penetration in a region is associated with a 4.5% decrease in FFS hospitalization costs and 0.2 shorter days of hospitalizations. Baker (1997, 1999, 2003) examine the effect of HMO penetration on spending and utilization on other beneficiaries with mixed results. He finds that there is a concave relationship between managed care penetration and FFS Medicare Parts A and B spending, where spending is increasing in HMO penetration until a maximum is hit at 18% penetration, after which spending decreases with increasing penetration. Chernew et al. (2008) find that increasing MA penetration reduces spending by FFS beneficiaries, particularly those with chronic conditions. They find that in an OLS specification, a 1% increase in MA HMO penetration decreases FFS utilization by 0.3%, but when they account for endogenous penetration by using payments as an instrument they find a decrease of 0.9%. Robinson (1996) examines the spillover effect of managed care on healthcare expenditures and utilization. He finds that hospital expenditures grew 44% less rapidly in markets with high HMO penetration compared with low penetration, mostly due to reduction in the volume and mix of services. Bundorf et al. (2004) find that rates of revascularization and cardiac catheterization for FFS Medicare patients with acute myocardial infarction are lower in high HMO penetration markets than in low penetration ones. Johnson, Figueroa, Zhou, Orav, and Jha (2016) explore if MA enrollment has played a role in lowering spending growth in FFS Medicare. They find that counties in the highest quartile of baseline MA penetration had an associated decrease in FFS

Medicare spending growth at $154 annually per 10 percentage point increase in MA. These set of studies all suggest that Medicare Advantage influences the broader Medicare market at the inpatient utilization and spending level. However, none of these studies examine potential impacts of MA enrollment on postacute utilization and outcomes.

New contribution

This paper explores how MA enrollment in an area affects postacute care for all Medicare beneficiaries, and then separately within the FFS and MA cohorts, after an inpatient hospital stay. Thus, we explore both potential direct (within MA) and spillover (within FFS) effects. We exploited exogenous variation in county-level payments to MA plans over time driven by the program's bidding policy to test the extent to which MA enrollment led to changes in postacute utilization and quality among Medicare beneficiaries. Answering this question can help policymakers evaluate the value of the MA program on postacute use and potential unmeasured spillover value into the overall Medicare program.

Empirical Strategy

Basic specification

We examine the effect of MA enrollment on Medicare postacute utilization and outcomes at the county-level, conditional on inpatient stay, for overall Medicare discharges and then separately for FFS and MA discharges. We begin with a baseline specification describing the relationship between Medicare Advantage penetration and a range of postacute related utilization.

$$Y_{ict} = \beta_c + \beta_1 Penetration_{ct} + \beta_2 X_{ict} + \beta_3 C_{ct} + \beta_4 Year_t + \varepsilon_{ict} \quad (1)$$

The basic specification (Equation 1) regresses utilization and outcome measures Y_{ict} for individual *i* in county *c* in year t on MA penetration in county *c* in year *t*, Medicare beneficiary demographics, X_{ict}, county-level characteristics, C_{ct}, and year dummies, $Year_t$. Beneficiary covariates include age, sex, race, Charlson comorbidity index, and frailty status. County-level covariates include number of SNFs/HHAs/physicians per capita in the county, MA and FFS beneficiary risk scores, and FFS spending.

The main independent variable of interest is year-specific county level Medicare Advantage penetration where the beneficiary resides. Because MA plans tend to operate in markets where there are higher FFS Medicare spending, or markets where MA payment are more generous, to be more profitable, MA enrollment may be endogenous to the intensity of utilization and level of spending (Chernew et al., 2008). We may be also concerned with other unobserved market-level variables correlated with managed care entry decisions, penetration, and outcomes, which confound identification. Further, comparing use and outcome between MA and FFS is complicated by selection concerns. There is evidence that there is non-random sorting of beneficiaries into MA and that healthier patients are more likely to opt into MA (McWilliams, Hsu, & Newhouse, 2012; Newhouse & McGuire, 2014). Therefore, the cost and services provided in FFS will rise and be more intense because that population will be, on average, less healthy. We would expect that conditional on such sorting, greater intensity services will be higher in FFS

markets with high MA penetration, unless practice styles from MA spilled over into FFS. Because where managed care organizations operate is confounded by patient risk profiles and given expectations that healthier enrollees choose MA, ordinary least square estimates may be biased.

Instrumental variables (IVs)

To address this issue, CMS payments to MA plans at the county level are used as an instrument in two-stage least squares regressions. The key policy lever available to the government to influence plan premiums, benefits, and enrollment is the benchmark payment rate. Insurers have considerable flexibility in designing plans to offer on the MA market, as described above. Plans differ in the premium charged to consumers, the provider network, and the benefit generosity, provided the benefits are at least as generous as those in FFS Medicare (Stockley, McGuire, Afendulis, & Chernew, 2014). Prior studies have shown that higher benchmark payment rates are associated with higher enrollment and a greater number of plans participating in the MA market (McGuire, Newhouse, & Sinaiko, 2011; Nicholas, 2014). The relationship between these payment benchmarks and enrollment allows us to test for the effects of MA enrollment on postacute utilization in Medicare.

MA payment policy has evolved over time in an effort to maintain access to private plans while controlling costs (Baicker et al., 2013). From 2010-2011, payments to MA plans were calculated against a benchmark based on the highest of four statutory amounts: 1) urban or rural floor payment; 2) 100% of county risk adjusted lagged FFS costs; 3) an update based on the prior year's national average growth in FFS costs; and 4)

a 2% update over prior year's payment. A bidding process is compared to the county's benchmark. If a plan's bid is higher than the benchmark, it is required to collect the difference through a premium on its enrollees. If the bid is lower, 75% if the difference is returned to enrollees through increase benefits, while 25% is returned to Medicare.

Payment post-ACA, starting in 2012, utilized a different benchmark scheme. Each county's benchmark was a certain percentage (95%-115%) of the average per capita Medicare FFS spending for the county's residents, relative to spending for other counties (MedPAC, 2012). Specifically, county benchmarks were set at specified percentages of the per capita FFS Medicare expenditures, ranked by FFS spending. Starting with the top quartile, benchmarks are set at 95%, then 100%, 107.5%, and 115% of FFS spending. Plans were also able to earn quality bonuses, with plans >=4 stars have county benchmarks increased by 1.5% points in 2012, 3% in 2013, and 5% in 2014.

We take advantage of these statutory changes as exogenous shocks to MA enrollment to trace out the effects of managed care penetration on postacute utilization and outcome throughout the health care system, as similarly done in previous papers on inpatient services (Baicker et al., 2013; Chernew et al., 2008). We use $Payment_{ct}$, to identify the effect of MA penetration on outcomes (Equations 2 and 3). To the extent that these payment rate changes are correlated with penetration, but are orthogonal to postacute utilization and outcomes, IV estimates represent an improvement over corresponding OLS estimates.

$$Penetration_{ct} = \alpha_c + \alpha_1 Payment_{ct} + \alpha_2 X_{ict} + \alpha_3 C_{ct} + \alpha_4 Year_t + \varepsilon_{ict} \quad (2)$$

$$Y_{ict} = \gamma_c + \gamma_1 \widehat{Penetration}_{ct} + \gamma_2 X_{ict} + \gamma_3 C_{ct} + \gamma_4 Year_t + \xi_{ict} \quad (3)$$

Robustness checks

We test that MA enrollment changes induced by MA payments do not alter the composition of the FFS patient population (Appendix Table 1). There is the concern that enrollment shifts induced by payment changes are related to the health status or other traits that may affect utilization. For example, if the FFS beneficiaries who are induced by payment changes to leave the FFS system for MA are healthier than the typical FFS beneficiary, then the remaining FFS population may become less healthy on average. We address this issue in several ways. First, we estimated models with health status especially pertinent to older adults using nursing homes (Kan et al., 2018). Additionally, we investigate the association between payment changes and changes in the composition of our FFS sample. We estimate models that replace utilization with health status measures in order to test whether payment-induced changes in MA enrollment affected the composition of this group. We find that there is no association between FFS health status and changes in MA enrollment in our sample, consistent with previous finding of no systematic evidence of an association between favorable selection into MA and county-level penetration (Chernew et al., 2008; Mello, Stearns, Norton, & Ricketts, 2003).

We also conduct several robustness checks to test our conclusion of MA enrollment effect on postacute utilization in Medicare. We model changes in payment rates using year-specific payment instruments (Baicker et al., 2013). We also test the robustness of our binary outcomes using probit models to test our linear probability assumptions and report the marginal effects. We finally conduct analyses at the hospital level with hospital level fixed effects.

Data Sources

Healthcare cost and utilization project's (HCUP) state inpatient databases (SID)

Healthcare cost and utilization project's (HCUP) state inpatient databases (SID) includes the universe of all discharges, including information on insurance provider and discharge destination. We use data for Florida 2010-2014. There are several advantages to using Florida. First, Florida accounts for 10% of all Medicare Advantage enrollees nationally (KFF, 2017). Second, a high percentage of Medicare beneficiaries (42%) are enrolled in Medicare Advantage in Florida in 2017. Third, Florida SID reports whether Medicare enrollees are in FFS or an MA plan and their discharge destination, including post-acute facilities. Finally, Florida datasets include visit links to allow for identification of readmissions to inpatient hospitals.

We focused on Florida hospitals 2010-2014 for Medicare beneficiaries with an inpatient hospital stay discharged either to home or to a postacute facility. We excluded discharges from patients who did not reside in Florida and who were less than 65 years of age. We determined whether beneficiaries were enrolled in traditional FFS Medicare or in Medicare Advantage for the inpatient stay through the state inpatient discharge data by primary payer type. In our Florida sample, more than 45% of all inpatient discharges are attributable to Medicare patients, and 31% of those were in MA. Of these Medicare discharges, 89% are to home and postacute facilities, with hospice care as the next most popular discharge destination (4%) and inpatient death accounting for 3% of discharges.

MA payments and enrollments

We use data from CMS to quantify MA enrollment, payment rates, and plans characteristics from 2010-2014. The main independent and instrumental variables are created from these datasets. First, we construct the county-level MA penetration. Enrollment data come from CMS State/County/Contract Enrollment data file. Penetration come from the number of enrollees in HMO and local PPO plans out of the total number of eligible Medicare beneficiaries in the county. Second, we construct the instrument using county-level MA payment rates. County-level payment rates come from the Medicare Rate Book and the State/County/Plan database. We use aged rates from HMO and local PPO plans, weighted by the number of enrollees in these plans out of the total number of MA enrollees in the county. We use HMO and local PPO data because regional PPO and PFFS plans operate in different bidding schemes. We present variation in payment across our study years in Figure 1.

Outcome variables

We construct several outcome measures using the HCUP data. First, we examine among all hospitalized Medicare beneficiaries in our sample the probability of discharge home (versus to a postacute facility) using discharge destination variable available in the dataset. To test whether the average hospitalized patient would have received more care intensive services, we also construct the probability of each discharge destination type (home, skilled nursing, home health, inpatient rehab, long-term care hospital). The HCUP data also allows for the calculation of quality of care through revisit links, which allows for measure of readmissions after a discharge to postacute care. We construct these quality measures by first excluding planned inpatient readmissions, and then linking

revisit variables within the calendar year to calculate 30-day readmissions from the discharge of an inpatient hospital stay.

We also examine the above outcomes for postacute users only, a relatively higher risk margin of hospitalized patients. For discharge destination, we examine the probability of going to one of the four types of postacute facilities (skilled nursing, home health, inpatient rehabilitation, and long-term care hospital). All models are binary outcomes where we use linear probability models.

Covariates

The Area Health Resource File (AHRF) provides county-level economic and demographic covariates by year, which we merged to patients' county of residence. The AHRF provides county-level hospital and postacute care characteristics, including the number of skilled nursing facilities and home health agencies. We calculate the per capita SNF and HH agencies and the number of physicians in the county. We also control for county-level MA and FFS health risk scores, obtained from the MA plan enrollment files and FFS Medicare geographic variation files, and county FFS spending adjusted for price, age, sex, and race, obtained from the Dartmouth Atlas Medicare Spending files.

Patient-level controls include age, race, and sex, derived from the HCUP hospital discharge file. In addition to demographics, Charlson comorbidity index was constructed from diagnoses codes of the inpatient hospitalization (Deyo, Cherkin, & Ciol, 1992). We utilize the Charlson because of its construction using only inpatient claims codes compared to other comorbidity measures that utilize both outpatient and inpatient information (i.e Elixhauser, HCC). We also include a measure of geriatric risk scores that

captures conditions related to frailty, functional status, and other conditions common among high risk users of the elderly more likely to use additional post-hospital care (Kan et al., 2018).

Results

3.1 million discharges are included in our final sample based on restrictions described above. Thirty-seven percent of discharges were covered by Medicare Advantage. MA discharges tended to be younger, more likely to be Black or Hispanic and less frail (Table 1). They also tended to be in counties with higher MA payments and higher FFS spending.

First stage

Table 2 shows the results of our first stage estimations for our instrumental variable model. All regressions include county and year fixed effects as well as other covariates. Standard errors are clustered at the county level. The results suggest that an increase in benchmark payment of $100 increases penetration by about 3 percent, all significant at the $p<0.01$ level, which are comparable to estimates reported elsewhere in the MA literature at 3-5% (Baicker et al., 2013; Chernew et al., 2008).

OLS and IV estimates

We begin by analyzing outcomes at the county level for postacute users (Table 3). Recall that this will only capture care conditional on having been admitted to the hospital and discharged to postacute. Both the OLS and IV estimates suggest that there is no

statistically significant relationship between MA enrollment and outcomes among postacute users. We do consider the magnitude and direction of these estimates (Figure 2). In our OLS estimates for discharge probability to SNFs, there is an increase by one percentage point (s.e. 0.01) among all FFS Medicare postacute users with every 10% increase in MA enrollment in the county, but the direction is negative for MA. In contrast, our OLS estimates for discharge probability to HHAs decreases for FFS Medicare postacute users but the direction is positive for MA. As discussed above, there are several reasons why ordinary least squares regressions results indicating relationships of enrollment and utilization may be biased. Because SNFs are more care intensive and costly Medicare services, these OLS estimates could suggest that MA plans tend to operate in counties with higher FFS spending. The increased use of HHA among MA patients in greater MA enrollment counties could also suggest that healthier patients who use less intensive services are more likely to be managed care enrollees.

Our IV estimates are also not significant at the 0.05 level but we see the direction of some of our estimates change. In particular, IV estimates for the probabilities of discharge to SNF and HHA change for MA enrollees. These estimates suggest that a 10% increase in MA enrollment in a county leads to a five percentage point (s.e. 0.03) increase in the probability of being discharged to SNF ($p<0.1$) and a five percentage point (s.e. 0.03) decrease in the probability of being discharged to HHA for MA discharges. These IV estimates suggest that FFS and MA may use postacute services similarly, where increased MA enrollment is associated with increased probability in discharge to SNF for both coverage types and decreased probability in discharge to HHA. The magnitude of these estimates is consistent with findings in previous studies. A 10% increase in MA

enrollment led to a five percentage point decline in hospitalization costs among all hospitalized Medicare patients and three percentage point decline in expected expenditures among FFS patients (Baicker et al., 2013; Chernew et al., 2008).

Table 4 shows the effect of MA penetration on utilization among all hospitalized Medicare patients. These estimates are only conditional on inpatient stay rather than both an inpatient and postacute use. Again, we show both the OLS and IV estimates and they are nonsignificant at the 0.05 level. Our ordinary least squares estimates remain robust in direction but are smaller in magnitude. Our IV estimates for the probability of being discharged to SNFs is still significant at the 0.1 level, suggesting that a 10% increase in MA enrollment leads to a two percentage point (s.e. 0.01) increase in the probability of being discharged to SNF and a two percentage point (s.e. 0.01) decrease in the probability of being discharged to HHA for MA discharges. When we examine outcome of 30-day readmissions related to a postacute discharge, we see no relationship between MA enrollment on 30-day readmissions among postacute discharges nor all hospitalized discharges and the magnitude is small.

Robustness checks

In probit models (Appendix Table 2) and year specific payment instruments (Appendix Table 3) we see our results hold. In both of these specifications, increase in county MA enrollment leads to an increase in probability of discharge to SNF across MA and FFS discharges and a decrease in probability of discharge to HHA. We also see these results hold in hospital fixed effect models (Appendix 4-6). Some estimates become statistically significant, suggesting that FFS discharges are more likely to be discharged

to skilled nursing facilities with increases in MA penetration, accounting for hospital level factors.

Discussion

In this context, we find that MA enrollment has little effect on postacute use and quality (as we are able to measure it) both within the overall Medicare market and separately within FFS and MA. Counties with higher MA enrollment did not have statistically different postacute discharge destinations or 30-day readmissions for either MA discharges, FFS discharges, or combined overall Medicare discharges. Results suggest that counties with higher MA enrollment potentially have higher probability of being discharged to more intensive postacute services (i.e. skilled nursing) among both MA and FFS discharges and lower probability of being discharged to less intensive services (i.e. home health and home).

Although results were not significant, the change in direction of these estimates are interesting to note. The OLS specifications suggest that there are potential selection biases into MA, as discussed above, and that accounting for these effects through the instrument is important when considering the effect of payment programs on healthcare utilization. When accounting for confounding factors, at least in the state of Florida, it appears that MA plans may not be offering postacute services as divergently from the FFS sector as previously suggested using some national databases (Huckfeldt et al., 2017; Kumar et al., 2018; Waxman et al., 2016). For example, in counties with higher MA enrollment, the IV specification suggests that there is a positive relationship with the

probability of being discharged to higher intensity services (i.e. skilled nursing) and negative relationship with lower intensity services (i.e. home health and home).

Some qualitative work suggests that discharge planning processes between hospitals and MA are heavily dependent on hospitals for deciding the site of postacute care, and MA plans become involved in choosing which specific SNF once SNFs are selected as the appropriate discharge setting (Gadbois et al., 2018). Similar work done to examine skilled nursing use among accountable care organization (ACO) participants reveal that reductions in SNF use were largely due to within-SNF changes specifically for ACO patients, rather than different SNF use (McWilliams et al., 2017). These findings may explain why we find null results in site of care in testing for intensity of services provided. Further research should examine that within each site of care, the intensity of services delivered to both FFS and MA discharges with increasing MA enrollment.

We also do not know what mechanisms MA plans are utilizing their postacute services in markets with high MA enrollment. For example, it may be that in counties with high MA enrollment, limited managed care resources and capacity to appropriately discharge patients to lower intensity services lead to discharges to more resource rich settings. Thus, counties with higher MA enrollment see increased probabilities of discharge to skilled nursing facilities because arranging home health services become too time- and resource-intensive for managed care organizations. If this is the case, it may be important to monitor the effects of these higher intensive care practices on FFS discharges to ensure that 'negative' care patterns are not spilled over.

Implications for policy and practice

These findings from one large state during the period 2010 to 2014 suggest that the presence of MA plans in a market do not significantly alter the utilization of postacute services, unlike previous findings in the inpatient and outpatient setting. Proponents of MA cite that higher payments to MA may be justified if MA indeed offered better care delivery to their enrollees or if their care delivery altered the care delivery of FFS beneficiaries. Recent regulations have steadily increased MA payment rates (3.4% rate hike in 2019 and proposed 1.6% in 2020). Regulators and policymakers should consider the value of these rates hikes on benefits offered and healthcare utilization, especially for the growing population of older Americans in need of post-hospital care. Despite nonsignificant effects of high MA enrollment and Medicare postacute utilization in this study, policymakers should continue to evaluate its potential effects on access, utilization, and quality of postacute for both MA enrollees and FFS beneficiaries.

Further, as MA plans continue to expand nonmedical benefits that may reduce utilization among high risk group of older Americans, payers and providers will need to evaluate the efficiency of those services. First, policymakers should monitor the uptake of these supplemental benefits by MA plans and the uptake of enrollees gravitating toward these plans. A recent study finds that only 10% of plans are offering caregiver support services in 2019 and even less for in-home support and personal care services, although they are allowable benefits (Creighton & Young, 2018). Research has also demonstrated plan characteristics significantly impact beneficiaries' decisions to enroll in MA and individuals sort themselves systematically into plans based on their health characteristics (Atherly, Dowd, & Feldman, 2004; Dowd, Feldman, & Coulam, 2003). If high need

patients continually disenroll from MA plans, additional federal payments and expanded benefits may not be helping those most at need.

Limitations

There are limitations to this work. First, we examine only the Florida Medicare market, which is a unique high-cost Medicare environment given its prior high growth rates (Large & Sear, 2005). Results may not be generalizable to other Medicare markets. Second, these estimates are conditional on an inpatient hospital stay; this may bias our results given that MA enrollees are less likely to be admitted to the inpatient setting in the first place (Afendulis, Chernew, & Kessler, 2017). Thus, MA patients in need of inpatient stays are a higher risk group that also need higher intensity post-hospital care (i.e. skilled nursing). This may contribute to the increased probability of being discharged to skilled nursing among MA discharges in counties with high MA enrollment. We also cannot interpret our findings as a causal mechanism; that is, higher MA enrollment did not cause different probabilities of utilization. Further research should explore the mechanisms that cause differential utilization. Finally, data comes from the HCUP State Inpatient Databases, sponsored by the Agency for Healthcare Research and Quality. Databases are derived from administrative data and contain encounter-level, clinical and nonclinical information. There may be concerns on the accuracy of reporting but because of limited access to MA information, using the HCUP SIDs have been common to explore MA effects (Baicker et al., 2013; Henke, Maeda, Marder, Friedman, & Wong, 2013; Nicholas, 2013).

Conclusion

To our knowledge, this is the first paper that examines the impact of growing MA enrollment on the probability of receiving postacute services in both the MA and FFS setting. Previous research in other contexts suggest that MA enrollment has an effect on utilization and spending in the Medicare market and spillovers from Medicare managed care are substantial in the inpatient setting. We extend the literature by examining utilization in Medicare postacute and take advantage of the changes in payment policy to gauge the causal effect of MA enrollment on system-wide postacute care and find little effect. We hope these negative findings will motivate continued research in other states and during more recent time periods. With the growing coverage of MA enrollees and greater use of post-hospital services, further payment policy changes to the MA program should not only monitor inpatient utilization and outcome but other types of utilization, access, and quality.

Table 3.1: Characteristics of Medicare beneficiary hospital discharges from Florida: All Medicare, Fee-For-Service (FFS) only, and Medicare Advantage (MA) only, 2010-2014

	Medicare	FFS	MA
n	**3,100,841**	**2,125,287**	**975,554**
Beneficiary characteristics			
Age	78.1 (8.1)	78.7 (8.3)	77.0 (7.8)
Female	55.9%	56.5%	54.6%
Race			
White	76.6%	81.7%	65.7%
Black	8.7%	7.2%	12.1%
Hispanic	13.1%	9.7%	20.5%
Asian/PI	0.5%	0.5%	0.5%
Native American	0.1%	0.1%	0.1%
Other	1.0%	0.9%	1.2%
Clinical Characteristics			
Charlson comorbidity	2.1 (2.1)	2.1 (2.1)	2.0 (2.0)
ACG Frailty category			
0	73.7%	71.6%	78.4%
1	20.2%	21.5%	17.3%
2+	6.1%	7.0%	4.3%
Discharged home	47.9%	44.4%	55.5%
30-day readmissions	17.5%	18.3%	15.7%
Among postacute users, discharged to			
SNF	47.8%	48.8%	44.9%
HHA	45.1%	43.2%	50.4%
IRF	5.8%	6.6%	3.7%
LTCH	1.3%	1.4%	1.0%
County characteristics			
Number of SNFs/capita	0.04 (0.02)	0.04 (0.02)	0.03 (0.02)
Number of HHAs/capita	0.08 (0.06)	0.07 (0.06)	0.09 (0.07)
Number of physicians/capita	0.06 (0.07)	0.06 (0.07)	0.06 (0.06)
MA payment (PMPM), $	562 (201)	531 (197)	630 (193)
FFS risk score	1.1 (0.10)	0.96 (0.36)	1.14 (0.10)
MA risk score	1.0 (0.35)	1.10 (0.09)	1.14 (0.30)
MA enrollment (HMO/PPO), %	28.0 (14.6)	25.5 (14.3)	33.5 (13.9)
FFS spending (price, age, sex, race adjusted), $	11,459 (1,318)	11,290 (1,231)	11,828 (1,421)

Notes: Data comes from the Healthcare Cost and Utilization Project State Florida Inpatient Database (2010-2014), CMS Medicare public use files, Area Health Resource File, Dartmouth Atlas Medicare Spending File. Sample excludes inpatient discharges <65 year of age, not covered by Medicare, and not residing in Florida. Frailty category is constructed based on the Johns Hopkins ACG Risk Adjustment Methodology using hospital discharge diagnoses. County characteristics are average rates based on the patients' county of residence. MA payment is defined as aged payment of HMO and local PPO plans, weighted by the number of enrollees. MA enrollment is defined as HMO and local PPO plan enrollment out of the total number of Medicare beneficiaries in the county. FFS risk scores come from the FFS aged HCC score from CMS Medicare public use files; MA risk scores come from the weighted HMO and local PPO plan risk score from CMS Medicare public use files. FFS spending is defined as the price, age, sex, and race adjusted total spending in the county for FFS Medicare. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH); per-member-per-month (PMPM).

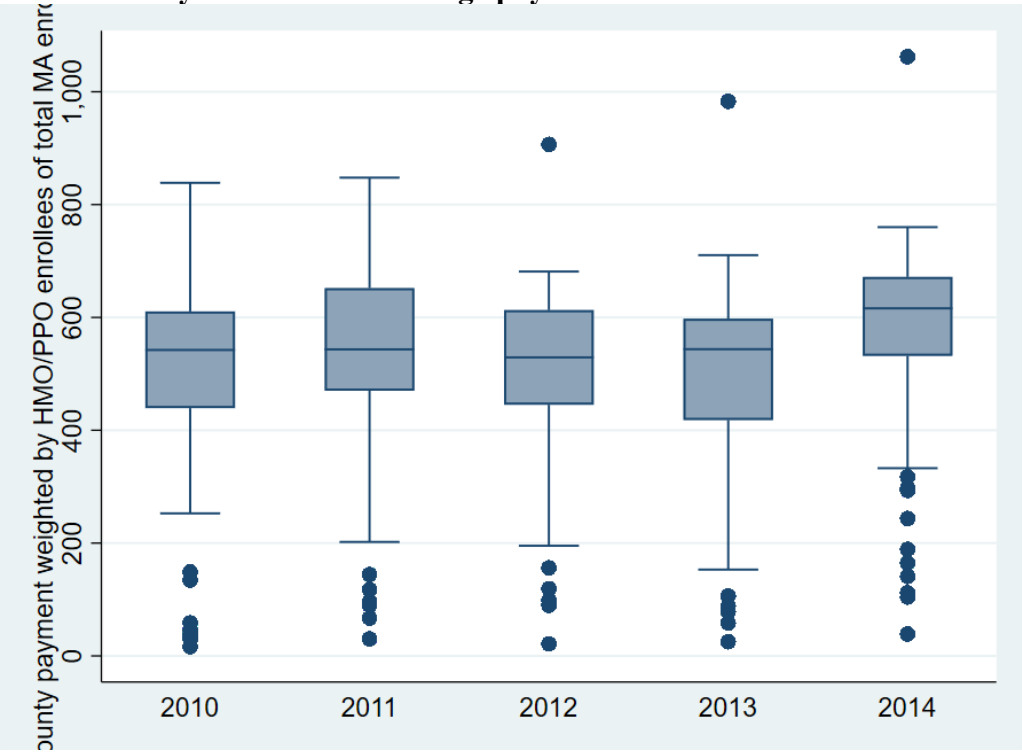
Table 3.2: First stage estimates of county Medicare Advantage (MA) payments on MA enrollment among Medicare hospitalized patients by enrollment type (FL, 2010-2014)

Outcome: MA Enrollment (1-100%)

	Home and postacute discharges			Postacute discharges only		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
MA Payment ($100 PMPM)	3.392***	3.206***	3.84***	3.385***	3.233***	3.839***
	(0.527)	(0.507)	(0.601)	(0.535)	(0.530)	(0.572)
F statistics	41.4	39.9	40.8	40.0	37.3	45.1
n	3,100,841	2,125,287	975,554	1,615,460	1,181,156	434,304

Notes: Left panel includes discharges to home and postacute in Florida 2010-2014 study sample. Right panel includes discharges to postacute only in FL 2010-2014 study sample. Models are run in counties (based on patients' county of residence) where Medicare (both FFS and MA) discharges occur in the sample, in counties where FFS discharges occur, and in counties where MA discharges occur. Dependent variable is MA enrollment defined as MA HMO and PPO enrollment, with units in percentages (1-100). MA payments are defined as unit increases of $100 per-member-per-month (PMPM) in HMO and local PPO payments, weighted by enrollment. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and county and year FE. Robust SE clustered at county. *** p<0.01; ** p<0.05; * p<0.1

Figure 3.1: County Medicare Advantage payment in Florida 2010-2014



Notes: County payment rate data are aged rates from the CMS Ratebook files for counties in Florida study sample. Payments are weighted by the HMO and local PPO enrollees of total MA enrollees in the county.

Table 3.3: Estimated effect of increase in MA enrollment in county on the probability of postacute destination and outcome among hospitalized Medicare postacute users by enrollment type, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment

	OLS			*IV*		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
n	**1,615,460**	**1,181,156**	**434,304**	**1,615,460**	**1,181,156**	**434,304**
			SNF			
	0.00116	0.00145	-0.000588	0.00331	0.00275	0.00512*
	(0.000959)	(0.00101)	(0.00111)	(0.00214)	(0.00212)	(0.00307)
			HHA			
	-0.000935	-0.00127	0.000168	-0.00324	-0.00301	-0.00476
	(0.00111)	(0.00120)	(0.00117)	(0.00261)	(0.00266)	(0.00313)
			IRF			
	-0.000233	-0.000164	0.000201	0.000624	0.00105	-0.000100
	(0.000744)	(0.000931)	(0.000492)	(0.00159)	(0.00195)	(0.000910)
			LTCH			
	5.60e-06	-1.87e-05	0.000218	-0.000691	-0.000788	-0.000260
	(0.000262)	(0.000351)	(0.000203)	(0.000777)	(0.00100)	(0.000354)
			30-day readmissions			
	-0.00120*	-0.00144	-6.37e-05	-0.000263	-0.000293	4.77e-05
	(0.000688)	(0.000912)	(0.000653)	(0.00124)	(0.00160)	(0.00112)

Notes:

a. Estimates reflect probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on county). Outcomes are coded as binary linear probability models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Ordinary least squares (OLS) estimates in left panel. Instrumental variables (IV) estimates in right panel and utilize MA county payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.

b. Sample excludes home discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and county and year FE.

c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH). *** p<0.01; ** p<0.05; * p<0.1

Table 3.4: Estimated effect of increase in MA enrollment in county on the probability of post-hospital destination and outcome among hospitalized Medicare postacute users and patients discharged home by enrollment type, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment

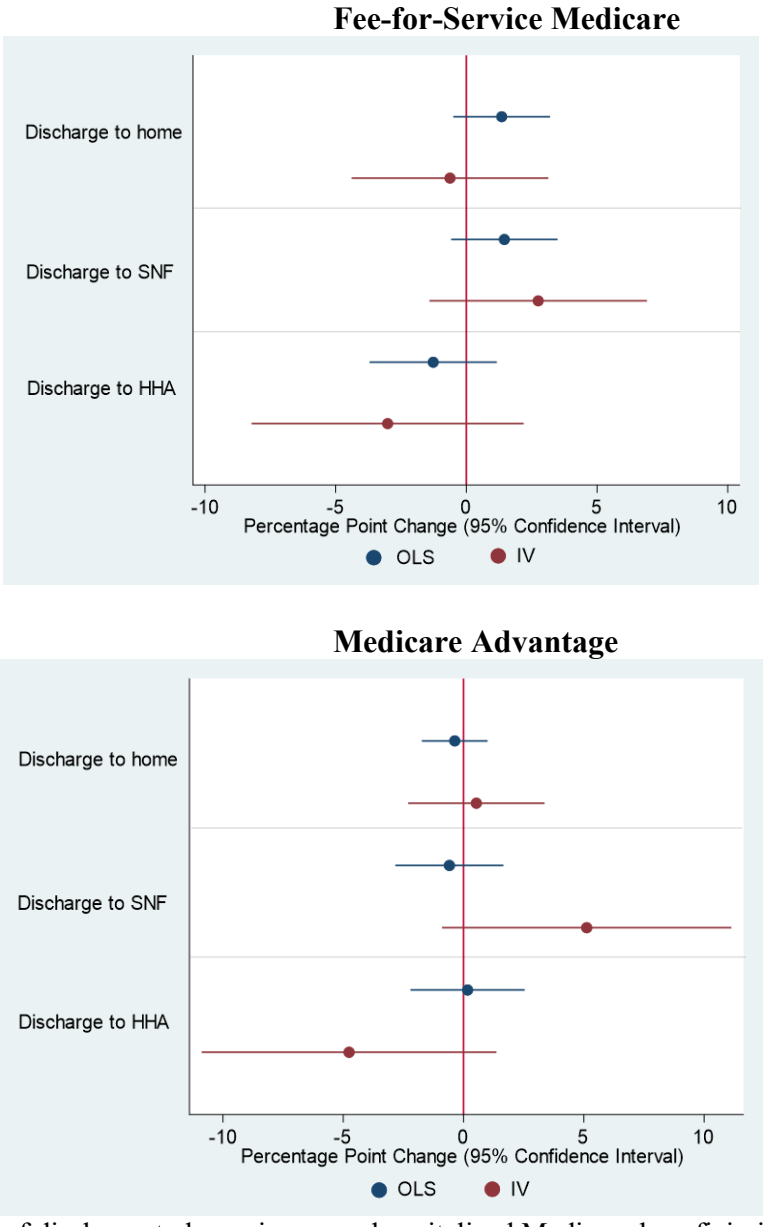
	OLS			*IV*		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
n	**3,100,841**	**2,125,287**	**975,554**	**3,100,841**	**2,125,287**	**975,554**
			Discharge home			
	0.000800	0.00135	-0.000366	-0.000129	-0.000627	0.000533
	(0.000788)	(0.000915)	(0.000676)	(0.00167)	(0.00192)	(0.00145)
			SNF			
	0.000167	0.000163	-0.000198	0.00179*	0.00186	0.00207*
	(0.000535)	(0.000607)	(0.000537)	(0.00107)	(0.00130)	(0.00115)
			HHA			
	-0.000832	-0.00136	0.000357	-0.00152	-0.00130	-0.00234
	(0.000708)	(0.000821)	(0.000714)	(0.00187)	(0.00199)	(0.00197)
			IRF			
	-0.000125	-0.000115	9.99e-05	0.000236	0.000527	-0.000140
	(0.000391)	(0.000530)	(0.000221)	(0.000800)	(0.00106)	(0.000381)
			LTCH			
	-9.51e-06	-3.86e-05	0.000107	-0.000376	-0.000460	-0.000125
	(0.000137)	(0.000198)	(9.30e-05)	(0.000393)	(0.000535)	(0.000164)
			30-day readmissions			
	-0.000868**	-0.000952	-0.000422	9.69e-05	0.000132	0.000435
	(0.000407)	(0.000577)	(0.000407)	(0.000879)	(0.00112)	(0.000710)

Notes:

a. Estimates reflect probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on county). Outcomes are coded as binary linear probability models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Ordinary least squares (OLS) estimates in left panel. Instrumental variables (IV) estimates in right panel and utilize MA county payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.

b. Sample includes home and postacute discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and county and year FE.
c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH).
*** p<0.01; ** p<0.05; * p<0.1

Figure 3.2: Estimated percentage point change in probability of outcome with 10% increase in county MA enrollment among fee-for-service Medicare and Medicare Advantage hospitalized discharges (FL, 2010-2014)



Notes: Outcome of discharge to home is among hospitalized Medicare beneficiaries discharged to home and postacute. Outcome of discharge to SNF and HHA is among hospitalized Medicare postacute users only. Fee-for-service (top) and Medicare Advantage (bottom) discharges are presented in different panels. Blue indicates ordinary least squares (OLS) models and red indicates instrumental variable (IV) models. On the x-axis, probability of outcome ranges from -10 to 10 percentage points. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA). See Tables 3 and 4 for more description of model specification.

Appendix Table 3.1: Estimated effect of increase in MA enrollment in county on selected health-related characteristics of fee-for-service Medicare sample

	FFS risk score	Charlson Index
MA enrollment	-0.000172	0.00426
	(0.00146)	(0.0042)
n	2,125,287	2,125,287

Notes: Estimates reflect increase or decrease in health-related characteristics in fee-for-service Medicare population; robust standard errors in parentheses (clustered on county). Charlson index estimate is the Charlson comorbidity index for FFS Medicare hospitalized beneficiaries in the study sample excluding <65 years old, not discharged to home or postacute, and those not residing in Florida. FFS risk score estimate is the county-level FFS risk scores where the FFS Medicare hospitalized beneficiaries in the study sample reside in. County MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Models utilize MA PMPM county payment as the instrument. Models adjust for age, sex, race, #SNFs/HHA/physicians per capita, county FFS Medicare spending, and county and year FE. *** p<0.01; ** p<0.05; * p<0.1

Appendix Table 3.2: Estimated marginal effect (probit model) of increase in MA enrollment in county on the probability of postacute destination and outcome among hospitalized Medicare patients by enrollment type, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment

	OLS			***IV***		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
n	**1,615,460**	**1,181,156**	**434,304**	**1,615,460**	**1,181,156**	**434,304**
			SNF			
	0.00306	0.00381	-0.00155	0.00895	0.00745	0.00745
	(0.00256)	(0.00268)	(0.00300)	(0.00583)	(0.00580)	(0.00580)
			HHA			
	-0.00250	-0.00345	0.000461	-0.00884	-0.00833	-0.0128
	(0.00300)	(0.00325)	(0.00313)	(0.00714)	(0.00729)	(0.00846)
			IRF			
	-0.00223	-0.00248	0.00756	0.00514	0.00778	0.00263
	(0.00682)	(0.00742)	(0.00745)	(0.0147)	(0.0162)	(0.0165)
			LTCH			
	-0.000852	-0.00159	0.00780	-0.0306	-0.0321	-0.0166
	(0.00978)	(0.0120)	(0.00857)	(0.0311)	(0.0370)	(0.0192)
			30-day readmissions			
	-0.00426*	-0.00497	-0.000205	0.00347**	0.00397**	0.00554***
	(0.00242)	(0.00315)	(0.00247)	(0.00141)	(0.00160)	(0.00877)

Notes:

a. Estimates reflect the marginal probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on county). Outcomes are coded as binary probit models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Ordinary least squares (OLS) estimates in left panel. Instrumental variables (IV) estimates in right panel and utilize MA county payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.

b. Sample excludes home discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and county and year FE.

c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH). *** p<0.01; ** p<0.05; * p<0.1

Appendix Table 3.3: Estimated effect of increase in MA enrollment (using year-specific payment instrument) in county on the probability of postacute destination and outcome among hospitalized Medicare patients by enrollment type, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment			
		IV	
	Medicare	**FFS**	**MA**
n	**1,615,460**	**1,181,156**	**434,304**
		SNF	
	0.00330	0.00275	0.00505*
	(0.00213)	(0.00211)	(0.00306)
		HHA	
	-0.00323	-0.00301	-0.00470
	(0.00260)	(0.00264)	(0.00312)
		IRF	
	0.000623	0.00105	-8.94e-05
	(0.00158)	(0.00194)	(0.000907)
		LTCH	
	-0.000689	-0.000785	-0.000259
	(0.000773)	(0.000995)	(0.000353)
		30 day readmissions	
	-0.000255	-0.000282	5.32e-05
	(0.00123)	(0.00159)	(0.00112)

Notes:
a. Estimates reflect the marginal probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on county). Outcomes are coded as binary linear probability models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Instrumental variables (IV) estimates utilize MA county year-specific payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.
b. Sample excludes home discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and county and year FE.
c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH). *** p<0.01; ** p<0.05; * p<0.1

Appendix Table 3.4: First stage estimates of county Medicare Advantage (MA) payments on MA enrollment among Medicare hospitalized patients, hospital fixed effects

Outcome: MA Enrollment (1-100%)

	Home and postacute discharges			Postacute discharges		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
MA Payment ($100 PMPM)	3.305***	3.330***	3.312***	3.314***	3.357***	3.259***
	(0.3854)	(0.379)	(0.460)	(0.353)	(0.358)	(0.390)
F statistics	73.6	77.1	51.9	88.1	87.8	69.8
n	3,097,522	2,123,704	973,818	1,614,248	1,180,436	433,812

Notes: Left panel includes discharges to home and postacute in Florida 2010-2014 study sample. Right panel includes discharges to postacute only in FL 2010-2014 study sample. Models are run in hospitals where Medicare (both FFS and MA) discharges occur in the sample, in hospitals where FFS discharges occur, and in hospitals where MA discharges occur. Dependent variable is MA enrollment defined as MA HMO and PPO enrollment, with units in percentages (1-100). MA payments are defined as unit increases of $100 per-member-per-month (PMPM) in HMO and local PPO payments, weighted by enrollment. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and hospital and year FE. Robust SE clustered at hospital. *** p<0.01; ** p<0.05; * p<0.1

Appendix Table 3.5: Estimated effect of increase in MA enrollment in county on the probability of postacute destination and outcome among hospitalized Medicare postacute users by enrollment type using hospital fixed effects, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment

	OLS			***IV***		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
n	**1,614,248**	**1,180,436**	**433,812**	**1,614,248**	**1,180,436**	**433,812**
			SNF			
	0.00173**	0.00187**	0.000818	0.00279**	0.00355**	0.00176
	(0.000690)	(0.000818)	(0.000693)	(0.00127)	(0.00160)	(0.00142)
			HHA			
	-0.00205***	-0.00238***	-0.00134**	-0.00236*	-0.00269*	-0.00249*
	(0.000689)	(0.000798)	(0.000663)	(0.00129)	(0.00157)	(0.00137)
			IRF			
	0.000279	0.000445	0.000495	-0.000327	-0.000717	0.000569
	(0.000335)	(0.000399)	(0.000301)	(0.000689)	(0.000899)	(0.000556)
			LTCH			
	4.05e-05	6.93e-05	2.52e-05	-0.000105	-0.000142	0.000161
	(0.000120)	(0.000151)	(0.000100)	(0.000295)	(0.000391)	(0.000256)
			30-day readmissions			
	-0.000263	-8.42e-05	-8.91e-05	-0.0019***	-0.0023***	-0.00063
	(0.000420)	(0.000514)	(0.000379)	(0.00067)	(0.00081)	(0.00085)

Notes.

a. Estimates reflect probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on hospital). Outcomes are coded as binary linear probability models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Ordinary least squares (OLS) estimates in left panel. Instrumental variables (IV) estimates in right panel and utilize MA county payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.

b. Sample excludes home discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status, #SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and hospital and year FE.

c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH). *** $p<0.01$; ** $p<0.05$; * $p<0.1$

Appendix Table 3.6: Estimated effect of increase in MA enrollment in county on the probability of post hospital destination and outcome among hospitalized Medicare postacute users and patients discharged home by enrollment type using hospital fixed effects, OLS vs IV results (FL, 2010-2014)

Independent variable: MA enrollment

	OLS			IV		
	Medicare	**FFS**	**MA**	**Medicare**	**FFS**	**MA**
n	**3,097,522**	**2,123,704**	**973,818**	**3,097,522**	**2,123,704**	**973,818**
			Discharge home			
	0.00130**	0.00159**	0.000123	0.00015	-0.000058	0.00052
	(0.000615)	(0.000726)	(0.000672)	(0.0011)	(0.0013)	(0.0011)
			SNF			
	0.000283	0.000305	0.000220	0.00107	0.00169*	0.000340
	(0.000399)	(0.000510)	(0.000420)	(0.000720)	(0.000940)	(0.000777)
			HHA			
	-0.00166***	-0.00206***	-0.000551	-0.00103	-0.00127	-0.00111
	(0.000537)	(0.000620)	(0.000474)	(0.000946)	(0.00117)	(0.000846)
			IRF			
	4.82e-05	0.000124	0.000184	-0.000159	-0.000318	0.000168
	(0.000160)	(0.000196)	(0.000135)	(0.000335)	(0.000461)	(0.000240)
			LTCH			
	2.76e-05	4.04e-05	2.44e-05	-3.50e-05	-4.87e-05	8.19e-05
	(5.69e-05)	(7.46e-05)	(4.34e-05)	(0.000142)	(0.000198)	(0.000110)
			30-day readmissions			
	-0.000259	-0.000139	-0.000136	-0.0012***	-0.0014***	-0.00045
	(0.000257)	(0.000292)	(0.000261)	(0.00046)	(0.00051)	(0.00057)

Notes:

a. Estimates reflect probability of increase or decrease in utilization or readmission rates with a 1% change in MA enrollment; robust standard errors in parentheses (clustered on hospital). Outcomes are coded as binary linear probability models (=1 for discharge to a destination or experiencing readmissions; =0 otherwise). MA enrollment is defined as MA HMO and PPO enrollment, with units in percentages (1-100). Ordinary least squares (OLS) estimates in left panel. Instrumental variables (IV) estimates in right panel and utilize MA county payment per-member-per-month (PMPM) as the instrument. Models are run in Medicare (both FFS and MA) discharges, in FFS discharges, and in MA discharges.

b. Sample includes home and postacute discharges of inpatient Medicare patients in Florida 2010-2014 study sample. Models adjust for age, sex, race, Charlson comorbidity, frailty status,

#SNFs/HHA/physicians per capita, county risk scores (FFS and MA), county FFS Medicare spending, and hospital and year FE.
c. Abbreviations are as follows: skilled nursing facility (SNF); home health agency (HHA); inpatient rehabilitation facility (IRF); long-term care hospital (LTCH).
*** p<0.01; ** p<0.05; * p<0.1

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CHAPTER FOUR

ASSOCIATION BETWEEN QUALITY AND MEDICARE ADVANTAGE PATIENTS IN NURSING HOMES

Abstract

Background: The characteristics of nursing homes serving Medicare Advantage (MA) patients is not well understood. With increasing coverage of older Americans by MA, there is little understanding whether MA plans, and consumers with MA coverage, concentrate in high quality nursing facilities aided by public reporting to guide their decisions on nursing home selection. The study first aims to examine the quality measures associated with a facility with a high percentage of MA patients. Second, the study aims to examines whether the relationship between quality and percentage of MA patients changes after the introduction of national nursing home quality reporting programs: Nursing Home Compare in 2002 and the updated "5-star" rating program in 2008.

Methods: Using nursing home facility level Long-Term Care Focus datasets developed by Brown University, longitudinal trends of nursing home use by Medicare Advantage enrollees were examined over the period 2000 to 2010. Logistic regressions were used to examine the association between quality metrics of nursing homes and the percentage of MA patients served. Finally, an interrupted time series design was used to examine the relationship between changes in MA patients and quality metrics after national public reporting.

Results: Nursing homes with high percentage (>25%) of MA patients are more likely to have greater total registered nurse (RN) hours per resident day and worse clinical quality.

During the study period, total nursing staffing hours increased during the study period, but high MA facilities saw greater increases of RN hours. Specifically, higher RN hours are associated with greater odds of being a high MA facility. The introduction of the first round Nursing Home Compare reporting program and then the transition to the simpler star rating reporting program had mixed or minimal associations with changes in percentage of MA patients and quality metrics.

Conclusion: MA patients may be receiving different nursing care compared to other Medicare beneficiaries. Public reporting of quality measures may not have great influences on where MA patients receive their care. Other indicators may be driving provider networks, collaboratives, and other formal and informal relationships. As MA plans continue to attract a larger share of the Medicare population relative to FFS Medicare, more information on the nursing home decisions made by MA plan enrollees and the outcomes of those choices are of vital policy importance

Introduction

Medicare has promoted enrollment in private capitated plans for Medicare beneficiaries for the past 25 years. Currently known as Medicare Advantage (MA), the goal of these private Medicare plans has been to incentivize closer management of healthcare and innovation through at-risk contracts. For example, starting in 2019 MA plans can offer health related supplemental benefits such as in-home support services and other newly allowable benefits that could benefit an aging population. Due to the appeal of these and other benefits, 33% of all Medicare beneficiaries chose to enroll in MA in 2017 and the program is expected to grow to 40% by 2025 (Medicare Payment Advisory Commission [MedPAC], 2015). During this high MA growth period, there has also been an increasing use of nursing homes among Medicare beneficiaries. The proportion of MA enrollees in nursing homes more than doubled between 2000 and 2013, increasing 125% during the past two decades (Jung, Li, Rahman, & Mor, 2018).

Nursing home quality has long been a contentious policy issue (Zhang & Grabowski, 2004). There has been disagreement as to which indicators are appropriate and which initiatives for improving quality are effective (Bostick, Rantz, Flesner, & Riggs, 2006; Castle & Ferguson, 2010). Public reporting of quality measures has been used as one approach to facilitate direct consumer choice of high-quality facilities and thus offer incentives to lower-quality facilities for improvement. Quality of care and safety information in these public reports have typically include staffing levels, discrete clinical quality measures, and results from state-run health inspections. In 2002, the Centers for Medicare and Medicaid Services (CMS) launched Nursing Home Compare (NHC) to document and report quality measures intended to offer consumers information

to guide their care decisions. Previous to this program, there were no systematic mechanism to inform consumers regarding quality of nursing homes. In 2008, CMS converted the reporting of individual measures on NHC to a 1 to 5-star rating system to simplify and present a global measures of nursing home quality.

Previous research has documented the effects of nursing home public reporting; finding that quality improved after implementation, where consumer demand resulted in loss of market share for lower quality facilities, patient sorting occurred such that high-risk patients were more likely to be in higher-quality facilities, and quality improved for the care received by dual-eligible nursing home residents (Grabowski & Town, 2011; Konetzka, Grabowski, Perraillon, & Werner, 2015; Mukamel, Weimer, Spector, Ladd, & Zinn, 2008; Werner, Stuart, & Polsky, 2010; Werner, Konetzka, & Kim, 2013; Werner, Konetzka, & Kruse, 2009; Werner, Konetzka, & Polsky, 2016; Werner, Konetzka, Stuart, & Polsky, 2011; Werner, Norton, Konetzka, & Polsky, 2012). There is limited research examining the quality of care received by Medicare Advantage nursing home residents and the existing findings are mixed. Among all nursing home residents (including both postacute and long-term patients), facilities with higher share of MA residents tend to have better quality indicators (Jung et al., 2018). However, among those admitted on a postacute basis, findings suggest that MA patients are more likely to enter lower quality facilities compared to their fee-for-service Medicare counterparts (Meyers, Mor, & Rahman, 2018).

The previous studies examining public reporting have not examined its impact on beneficiaries enrolled in Medicare Advantage plans, where there are strong financial incentives to avoid unnecessary care. With increasing coverage of older Americans by

Medicare Advantage, there is little understanding whether MA plans, and consumers with MA coverage, concentrate in high quality nursing facilities potentially aided by public reporting to guide their decisions on nursing home selection. This study aims to expand our understanding of the MA program and its use of nursing homes by examining the association between nursing home quality levels and share of Medicare Advantage residents. In particular, the study first aims to examine the quality measures associated with a facility with a high percentage of MA patients. Subsequently, the study aims to examines whether the relationship between quality and percentage of MA patients changes after the introduction of each of CMS' nursing home quality reporting programs: Nursing Home Compare in 2002 and the updated "5-star" rating program in 2008.

Methods

Data sources

The primary dataset used for this analysis was developed by Brown University, which collates publicly available nursing home metrics available from CMS and other federal sources over time. This dataset, known as "Long-Term Care Focus" (http://ltcfocus.org/), combines nursing home information from Online Survey Certification and Reporting (OSCAR), Minimum Data Set (MDS), Area Health Resource File, and Medicare enrollment and claims data to build the residential history file (RHF). The RHF is a per-person chronological history of all persons who had either an MDS assessment or a skilled nursing facility (SNF) claim during the calendar year (Intrator, Hiris, Berg, Miller, & Mor, 2011). Then using the first Thursday in April in each of the study years, the sample contains people who had a nursing home episode that covered

that date, which includes a SNF stay, a non-SNF stay, or receiving hospice care in nursing homes. We use the facility-level dataset which aggregates the residential history file up to the institution as our main data source.

Study population

We include all nursing homes certified by Medicare and Medicaid from 2000-2010. From LTCFocus, 18,049 facilities, contributing 177,987 observations, were present for the 2000-2010 timespan. We restricted the sample to facilities reporting percentage of MA residents, which reduced our sample to 15,651 unique facilities and 96,667 facility-year observations from 2000-2010. Data from 2010 were used to identify characteristics of nursing homes.

Main independent variables

The main variables of interest are staffing levels and clinical quality measures of nursing homes. We include several measures of staffing from LTCFocus that calculates staffing hours during the two weeks prior to the annual OSCAR survey divided by the number of residents in the facility. This is the standard staffing measures reported in the literature and was used in Nursing Home Compare. The staff categories include registered nurse (RN) per resident day, licensed practical nurse (LPN) per resident day, certified nursing assistant (CNA) per resident day, and total nurse staff hours (RN + LPN + CNA) per resident day.

We use a mix of short- and long-stay clinical quality measures reported in Nursing Home Compare. These include postacute care measure—improvements in

walking—and chronic care measures—catheter use, bladder or bowel incontinence, urinary tract infection (UTI), and activities of daily living (ADL)—for the population of residents in nursing facilities on the first Thursday in April, drawn from the most recent MDS assessment. Improvement in walking is the facility's proportion of residents who can walk independently down a corridor. Residents with a catheter represents the facility's proportion of residents with an indwelling catheter. The residents with bladder or bowel incontinence measures are the facility's proportion of residents who are bladder or bowel incontinent in the past 14 days of the most recent MDS. Residents with UTI represents the facility's proportion of residents with a UTI in the last 30 days of the most recent MDS. Finally, the average ADL is the facility's residents' average ADL score calculated from seven ADLs – bed mobility, transfer, locomotion on unit, dressing, eating, toilet use, and personal hygiene. The ADL score range is 0-28, where 0 indicates complete independence. Walking quality is reverse coded in our analyses so that all quality measures can be interpreted such that lower percentages and scores indicate better quality. For more information regarding these individual measures and which MDS questions were used to derive measures, please refer to the LTCFocus data page (http://ltcfocus.org/).

Main dependent variable

The main outcome of interest is facility's percentage of Medicare Advantage residents. This number is derived for each facility in LTCfocus based on Medicare enrollment files for the proportion of residents covered by Medicare Health Maintenance

Organization on the 1st Thursday of April each year. Again, refer to the LTCFocus data page (http://ltcfocus.org/) for more information.

Covariates

Facility-level covariates are added to the model to explore the association of these factors and the percentage of MA patients and to help isolate the relationship between facility quality and MA. Facility-level covariates include structural characteristics (occupancy rate, total number of beds, profit status, hospital-based facility, chain-based facility), patient demographics (average age, percent female residents, percent White, Black, and Hispanic residents), patient case mix (percent of residents admitted directly from hospitals, percent that are skilled nursing days, and % Medicaid). We also include the county-level Medicare Advantage penetration rate for the facility, to control for the growth in MA enrollment in the mid-2000s, and geographic region. For missing observations on these covariates, the mean was calculated for each variable by year and this was applied for the missing indicator in all models. Sensitivity analyses were done without missing covariates (Appendix Tables 1 - 2).

Statistical analyses

We first describe the characteristics of nursing homes in the sample using 2010 characteristics by categorizing facilities to high share of MA ($\geq$25%), low share of MA (1-24%), and no MA residents (0%). Then we create longitudinal panels to examine the quality and staffing trend over the 11-year period stratified by these MA categories.

Next, we used logistic regressions models to evaluate the adjusted associations between staffing and quality characteristics and the likelihood of being a high percentage MA facility compared to low and no MA facility. For ease of interpretation, continuous variables in staffing, quality, structural characteristics, patient demographics, and patient case mix are categorized as "high" if they are above the median and "low" if they are below. To evaluate the associations, we run several models. First, we run a base model including only facility structural characteristics, patient demographics, patient case mix, and geographic characteristics (Model 1). Second, we run a model without the base covariates but with staffing and quality (Model 2). Then, we run models that include base plus staffing levels (Model 3), and then separately base plus quality measures (Model 4). Finally, we run the full model using base plus staffing and quality (Model 5).

Finally, we test for changes in the percentage of MA patients after the initial introduction of Nursing Home Compare (NHC) in 2002 and its transition into 5-star rating in 2008. Specifically, we test whether changes in percentage of MA residents differed as a function of staffing and quality measures in the pre-NHC period compared with the post-NHC period. We estimate the following:

$$\%\ MA_{jt} = \beta_1 IndVar_{jt} + \beta_2 NHC_t + \beta_3 IndVar_{jt} * NHC_t + \beta_4 Facility_{jt} + \beta_5 County_{jt} + Year + Facility + \varepsilon_{jt}$$

where percentage of Medicare Advantage residents is a function of independent variable (staffing or quality measures), pre- or post-NHC indicator variables, interaction of independent variable and NHC indicator, time-varying covariates, and facility and year fixed effects. The main variable of interest is $\beta_3 IndVar_{jt} * NHC_t$, where the coefficient

represents the differential change in the percent of MA patients after Nursing Home Compare relative to staffing (or quality) compared to before Nursing Home Compare. For the first set of analyses examining the introduction of NHC, $\beta_2 NHC_t$ is coded as 0 for years 2000-2001 and 1 for 2003-2005. For the second set of analyses examining the transition of NHC into star rating, $\beta_2 NHC_t$ is coded as 0 for years 2006-2007 and 1 for 2009-2010.

Results

Nursing home characteristics by percentage of MA patients

Characteristics of nursing homes are summarized in Table 1. Facilities are categorized as having greater than 25% Medicare Advantage residents, 1-24% MA residents, and no MA residents. High MA facilities tend to have greater total RN hours per resident day compared to no or low MA facilities (0.49 vs. 0.38 and 0.38, $p<0.01$). High MA facilities also tend to have higher total nursing hours compared to low MA facilities but not facilities with no MA residents (3.49 vs. 3.19 and 3.57; $p<0.01$). High MA facilities tend to have worse quality measures than no and low MA facilities, though the differences are small. For example, percent with UTI is 12.0% for high MA vs. 11.8% for low MA and 10.7% for no MA ($p<0.01$). Lower percentages indicate better quality. Residents in high MA facilities were somewhat older on average, more likely to be female, more likely to be White than racial/ethnic minorities, and were less likely to be Medicaid beneficiaries. High MA facilities were also more likely to have patients admitted from the hospital and patients with more skilled nursing covered days than no or

low MA facilities. They were also more likely to be located in the Northeast or West region and in markets with high MA penetration.

Trend of staffing and quality measures in nursing homes by percentage of MA patients

Figure 1 shows the trend of staffing levels in nursing homes by the percentage of MA patients from 2000 to 2010, with vertical indicating the introduction of Nursing Home Compare in 2002 and transition into star rating in 2008. Facilities with greater than 25% of MA residents saw a greater increase in RN hours than facilities with low (1-24%) or no MA residents starting from 2008. The trend of LPN hours per resident day remain similar across different percentage of MA facilities, though a general increase in hours during the time period. Facilities with no MA residents saw an increase in CNA hours per resident day starting from 2007 compared to facilities with low or high MA, which saw general decrease in CNA levels. This all translated into greater increase of total nurse staff hours in no MA facilities compared to low or high MA facilities.

Figure 2 shows the trend of quality measures in nursing homes by the percentage of MA patients. For all quality measures, no MA facilities tend to have lower percentages or scores (indicating better quality) than low and high MA facilities. There is also a general trend of worsening quality among all facilities across the study years.

Adjusted relationship of staffing and quality measures on likelihood of being high percentage MA facility

Table 2 shows the adjusted odds ratio of being a high percentage MA patient facility versus low and no percentage of MA facility. In particular, we focus on various

measures of staffing and quality. Model 1 is our base model excluding staffing and quality measures; the odds ratios on structural, demographic, case mix, and geographic remain consistent even when we add in staffing and quality measures, suggesting that staffing and quality play an independent role in predicting the likelihood of being a high MA facility. Model 2 suggests that without accounting for other facility characteristics, the relationship between staffing and quality on likelihood of being high MA is overestimated. For example, high RN increases the odds of being a high MA facility by 1.92 ($p<0.01$). When accounting for other characteristics in models 3 and 5, the odds ratios decrease to 1.29 – 1.32 times ($p<0.01$) in models 3 and 5.

Overall the models show consistent associations. High RN increases the odds of being a high MA facility by 1.3 times ($p<0.01$). High LPN is positively associated whereas high CNA is negatively associated with high MA facility, but both are nonsignificant. High catheter use (OR=1.3, $p<0.01$), high levels of UTI (OR=1.4, $p<0.01$), and high ADL scores (OR=1.2, $p<0.05$), all indicating worse quality, increase the odds of being a high MA facility. Walking and incontinence issues are not associated with the odds of being a high MA facility.

Adjusted relationship of staffing and quality measures and percentage of MA residents after public reporting

Table 3 presents changes in the percentage of MA residents after Nursing Home Compare was initially introduced in 2002. The mean of RN hours is 0.33 so a 1-unit increase would mean almost quadrupling of RN time to 1.34 hours per resident-day. A more realistic change that allows staffing measures to vary might be a 50 or 10 percent

increase in staffing level. We present these interpretations. A 50 percent increase in RN hours was associated with a 0.08% ($p<0.01$) greater increase in MA patients after the introduction Nursing Home Compare in 2002 compared to before. There were no significant results for LPN or CNA hours on the percentage of MA residents before and after public reporting. Table 4 suggests that the transition into star rating in 2008 resulted in significant associations with CNA levels. A 50 percent increase in CNA hours was associated with a 0.70% ($p<0.01$) greater decrease in MA patients after 2008 than before. A 50 percent increase in RN hours was still associated with a greater increase in MA patients (0.13%, $p<0.05$). Taken together, a 50 percent increase in total nurse staff hours was associated with a 0.52% ($p<0.01$) greater decrease in MA patients after 2008 than before.

Quality measures also yield mixed results. With the introduction of public reporting, a 50 percent increase in patients who had urinary incontinence was associated with a 0.65% ($p<0.01$) greater increase in MA patients than before public reporting. In contrast, a 50 percent increase in patient with UTI was associated with greater decrease in MA patients (-2.36%, $p<0.01$). In 2008, worse quality was associated greater increase of MA patients. A 50 percent increase in patients whose walking did not improve was associated with 2.3% greater increase ($p<0.01$), with catheter use a 5.4% greater increase ($p<0.01$), with UTI a 3.6% greater increase ($p<0.05$), and worsening ADL a 1.6% greater increase ($p<0.01$) of MA patients.

Discussion

We explored the relationship between facility staffing and quality measures and the percentage of Medicare Advantage enrollees who are residents in US nursing home facilities. We find that nursing homes that are "high MA" facilities are more likely to have greater total RN hours per resident day and worse clinical quality. They are also less likely to serve racial and ethnic minority residents or Medicaid beneficiaries and more likely to be in markets with greater Medicare managed care penetration. High MA nursing homes also tend to serve more patients admitted directly from the hospital and those Medicare beneficiaries with skilled nursing covered days. We also find that among the US cohort of nursing homes in the database, total nursing staffing hours increased during the study period, but different types of nursing staff appeared to have been added differentially at high MA facilities vs those with no or low MA use levels. Most quality measures tended to worsen over the study period and no MA facilities consistently scored better. Specifically, we find that higher RN hours are associated with greater odds of being a high MA facility. Worsening catheter use, UTI, and ADL were also associated with greater odds of being a high MA facility. The introduction of the first round Nursing Home Compare reporting program and then the transition to the simpler star rating reporting program had mixed or minimal relationship with changes in the percentage of MA patients associated with improved metrics.

We find mixed results in the relationship between a facility's percentage of MA residents and its staffing and quality level. These results suggest that the intensity of nursing hours matters—high proportion of MA residents tended to be in and react with higher intensity nursing staff (i.e. RN hours) compared to lower intensity nursing staff.

There were also minimal changes in the percentage of MA residents by type of nursing staff after the introduction of Nursing Home Compare and its star rating system, even though these programs were aimed at enhancing sharing information directly to consumers and their families to increase the likelihood that higher quality facilities might attract more patients. The study also suggests that MA patients tend to be admitted to facilities with lower quality. Decreasing quality measures appear to be associated with being a higher MA facility, and there was no evidence that the implementation of the two public reporting initiatives lead to an increased use of higher quality facilities among MA patients. Whether or not the actual underlying quality was inferior at these facilities, or whether the documentation of quality problems was better due to increased scrutiny associated with MA plan is not known and should be the subject of future study.

The findings of this study are line with previous research that find that high MA facilities serve patients who were older, more likely to be female, less likely to be racial/ethnic minorities or Medicaid beneficiaries, and in the Northeast and West regions and in markets with high Medicare managed care penetration (Jung et al., 2018). We extend the work by examining additional quality measures and potential responses by MA patients (and potentially plans) to enhanced public reporting of nursing home metrics. Similar to Werner et al. (2012), we find significant but mixed and small response changes after public reporting. While prior work has described an increase in nursing home patients being covered by MA and nursing home characteristics associated with high proportion of MA residents, to our knowledge, we are the first to directly examine changes in the share of MA residents in response to public report card changes on Nursing Home Compare. While there is a vast literature on public reporting and patient

sorting by risk type, there is less research on insurance coverage type (i.e. dual-eligibles) and none on Medicare Advantage (Konetzka et al., 2015; Rahman, Grabowski, Gozalo, Thomas, & Mor, 2014).

Implications for policy and practice

The role of private plans has become increasingly important, considering that the proportion of MA enrollees in nursing homes increased to 20% of nursing home residents (Jung et al., 2018). These findings, coupled with research by Meyers et al. (2018) and Chang et al. (2016) that suggest MA patients are more likely to utilize lower quality skilled nursing facilities than FFS Medicare patients or find no differences in nursing home quality between MA and FFS Medicare enrollees, suggest that there are nuances in how MA plans are steering or placing their patients in nursing homes for postacute care or long-term care. Because this analysis did not have access to costs of care, MA plans may be steering their covered patients to less costly providers. Recent research has suggested that MA plans appear to steer patients to specific skilled nursing facilities but find no improvement in patient outcomes (Rahman, Meyers, & Mor, 2018). MA plans also may be more influenced by past relationships with SNFs and physicians who practice there and might not be as strongly influenced by quality when making network decisions.

CMS could more strongly incentivize MA plans to contract with efficient nursing facilities. CMS could require MA plans to be more transparent in the type nursing homes in their networks when Medicare beneficiaries make enrollment decisions or include nursing facility utilization and outcome measures in the Healthcare Effectiveness Data

and Information Set (HEDIS). Including nursing home outcomes in MA star ratings, where star ratings determine bonus payments from CMS, might encourage MA plans to contract with higher-quality facilities. However, if patient steering in MA does not result in improved outcomes and may actually lead to patients entering poorer quality nursing homes, should steering patients be encouraged? Future research should examine patient steering along with cost data to assess the trade-off between quality and cost. Additionally, as nursing homes are increasingly held accountable for the care they provide through payment programs such as the skilled nursing value-based purchasing policy, it will also be important to assess patient selection by insurance type from the provider perspective and not just the payer to ensure quality care is delivered to those in need.

Limitations

There are several limitations to this study. First, the relationship we estimate between a facility's staffing and quality level and percentage of MA patients may be endogenous, particularly in the presence of inadequate risk adjustment where the severity of patients admitted influences a facility's decision on staffing levels. Because high MA facilities tend to serve more skilled nursing days and patients admitted from the hospital, we do not know whether MA patients go to worse quality facilities or facilities that have lower quality indictors (which mainly reflect a patient's functional challenges) care for higher risk patients. Second, staffing measures used in this analysis are self-reported by the nursing home facility, which may vary in accuracy across type of facility (Castle, 2008). To address this issue, future research should use staffing measures derived from

payroll information to more accurately reflect staffing levels in nursing homes. We also do not distinguish between short-stay and long-stay nursing home residents, who have very different clinical needs and outcomes. One recent study suggested that 30% of all MA nursing home patients were long-stayers, with the remainder being postacute short term patients (Chang et al., 2016). This suggests that examining quality across both short- and long-stayers is important when gauging the relationship of MA enrollment and the choice of nursing facility by quality.

Conclusion

Despite these limitations, our findings have important implications. MA patients may be receiving differential care compared to other Medicare beneficiaries. Public reporting of certain quality measures may not have great influences on where MA patients receive their care. Other indicators may be driving provider networks, collaboratives, and other formal and informal relationships. As MA plans continue to attract a larger share of the Medicare population relative to FFS Medicare, more information on the nursing home decisions made by MA plan enrollees and the outcomes of those choices are of vital policy importance.

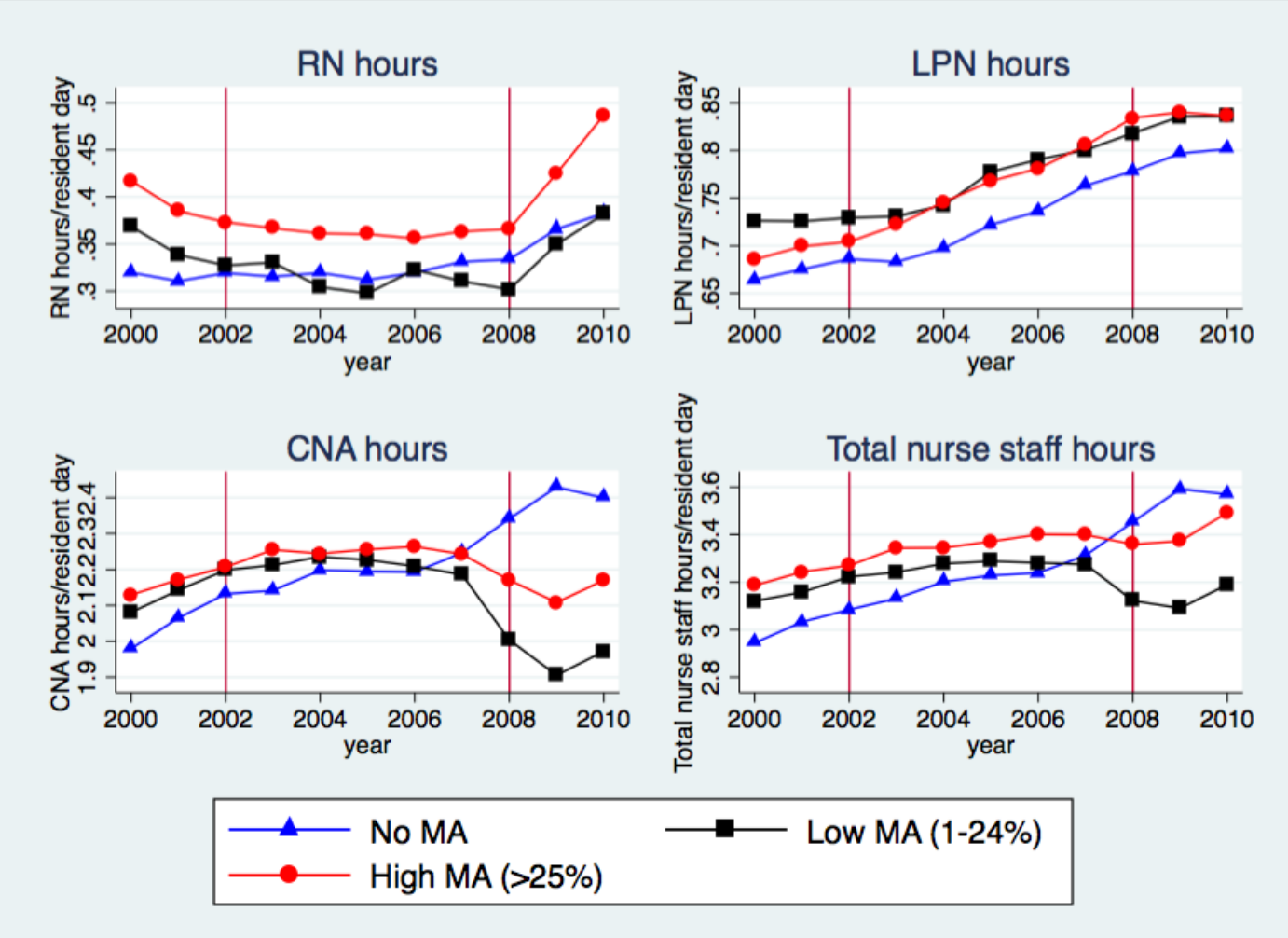
Table 4.1: Nursing home characteristics by percentage of MA patients served by nursing home facilities in 2010

(n)	High MA (≥25%) 2,691		Low MA (1-24%) 2,215		No MA (0%) 2,029		All NH 6,935	
	mean	sd	mean	sd	mean	sd	mean	sd
Staffing levels (high is better)								
Total RN hours/resident day	0.49	0.38	0.38	0.23	0.38	0.43	0.42	0.36
Total LPN hours/resident day	0.84	0.34	0.84	0.29	0.80	0.48	0.83	0.38
Total CNA hours/resident day	2.17	0.81	1.97	0.73	2.40	1.11	2.17	0.9
Total nurse hours/resident day	3.49	1.04	3.19	0.84	3.57	1.39	3.42	1.11
Quality measures (lower is better)								
% walking not improved	84.8	9.4	84.0	9.0	78.6	17.5	82.7	12.5
% bowel incontinence	52.9	13.8	53.2	12.7	50.2	15.1	52.2	13.9
% urinary incontinence	65.6	12.2	65.2	11.3	62.0	14.9	64.4	12.9
% catheter use	8.4	5.2	7.9	2.9	6.1	3.7	7.6	4.3
% UTI	12.0	3.6	11.8	3.2	10.7	3.9	11.3	3.6
Average ADL (0-28)	17.3	2.5	17.0	2.4	15.0	4.2	16.5	3.2
Facility structural characteristics								
% occupied	86.2	12.1	87.2	10.4	79.8	16.7	84.7	13.5
Total beds in facility	121.8	70.5	153.5	75.9	80.5	47.0	119.8	72.3
For profit	66%		71%		66%		68%	
Hospital based	5%		2%		8%		5%	
Part of a chain	58%		58%		48%		55%	

(n)	High MA (≥25%) 2,691		Low MA (1-24%) 2,215		No MA (0%) 2,029		All NH 6,935	
Patient demographics								
Average age, years	81.2	6.1	80.1	5.8	78.4	10.2	80.0	7.6
% White	83.9	20.6	81.8	22.0	83.3	21.6	83.0	21.4
% Black	7.8	17.4	11.6	20.5	9.2	20.2	9.4	19.3
% Hispanic	2.5	8.6	3.0	10.0	2.9	12.1	2.8	10.2
% Female	70.5	10.5	69.9	11.1	68.0	15.0	69.6	12.2
Patient case mix								
% SNF (postacute) days	21.7	13.9	17.4	9.4	14.0	11.0	18.1	12.2
% admitted from hospital	84.1	13.5	81.6	13.9	73.9	16.7	80.3	15.3
% Medicaid	57.1	21.4	63.3	17.1	65.9	23.0	61.7	21.0
Geographic characteristics								
Medicare managed care penetration	35.4	12.4	26.6	10.1	12.5	10.9	25.9	14.6
Region								
Northeast	25%		27%		12%		22%	
Midwest	31%		31%		36%		33%	
South	15%		29%		39%		26%	
West	29%		13%		13%		19%	

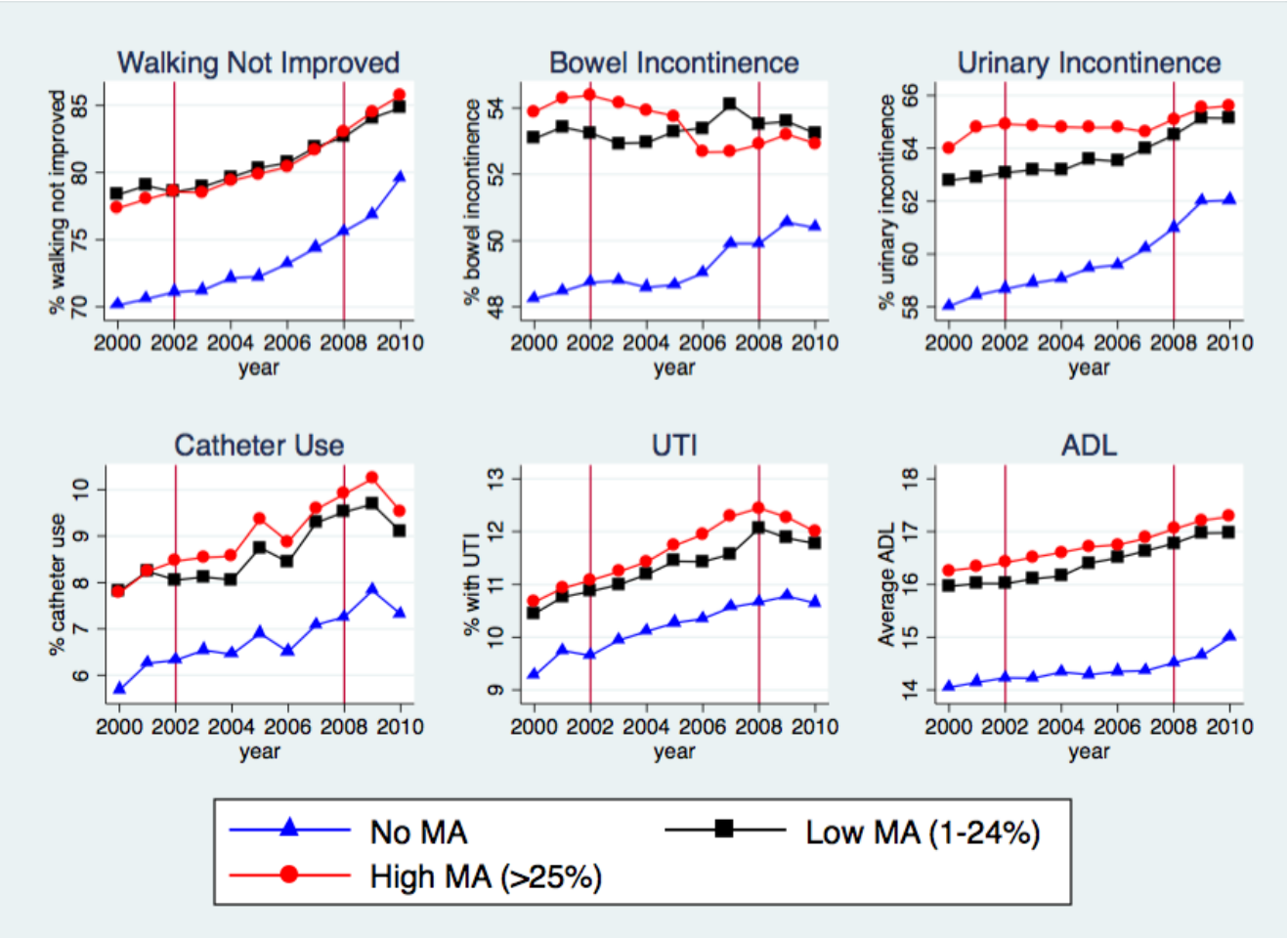
Notes. All p-values for categories of nursing homes based on the percentage of Medicare Advantage (MA) patients are statistically significant at p-value <0.01, except for % Hispanic (p-value = 0.16). One-way ANOVA tests were used to see if at least one group mean was statistically different from the other group means. Sample includes nursing homes in 2010 with reported percentage of Medicare Advantage (MA) residents. Quality measure % walking improved was reverse coded for ease of interpretation (lower is better). Abbreviations: Registered nurse (RN), Licensed practical nurse (LPN); Certified nursing assistant (CNA); Urinary tract infection (UTI); Activities of daily living (ADL); Skilled nursing facility (SNF). Definitions: total nurse staff hours/resident day is the total of RN, LPN, and CNA hours/ resident day.

Figure 4.1: Trend of staffing levels in nursing homes by percentage of MA patients from 2000-2010



Notes. Categories of MA residents based on percentages in 2010. n=2,691 for High MA (>25%); n=2,215 for Low MA (1-24%); n=2,029 for No MA (0%). Vertical lines indicate the initial start of Nursing Home Compare in 2002 and its transition into 5-star rating system in 2008

Figure 4.2: Trend of quality measures in nursing homes by percentage of MA patients from 2000-2010



Notes. Categories of MA residents based on percentages in 2010. n=2,691 for High MA (>25%); n=2,215 for Low MA (1-24%); n=2,029 for No MA (0%). Vertical lines indicate the initial start of Nursing Home Compare in 2002 and its transition into 5-star rating system in 2008. For all quality measures, lower means better.

Table 4.2: Adjusted odds ratios (OR) for being a high percentage MA facility by nursing home characteristics, 2010

	Odds of being high percentage MA facility				
Independent variables ("High" = above median)	Model 1	Model 2	Model 3	Model 4	Model 5
Staffing levels *(higher is better)*					
High RN hours/resident day		1.920***	1.324***		1.293***
		(1.730 - 2.131)	(1.165 - 1.506)		(1.136 - 1.471)
High LPN hours/resident day		1.126**	1.125*		1.088
		(1.015 - 1.249)	(0.993 - 1.274)		(0.959 - 1.234)
High CNA hours/resident day		1.050	0.990		0.985
		(0.949 - 1.162)	(0.876 - 1.120)		(0.871 - 1.115)
Quality measures *(lower is better)*					
High % walking not improved		1.044		0.936	0.928
		(0.932 - 1.169)		(0.820 - 1.069)	(0.813 - 1.061)
High % bowel incontinence		0.945		1.016	1.018
		(0.841 - 1.063)		(0.872 - 1.184)	(0.873 - 1.186)
High % urinary incontinence		1.115*		1.117	1.115
		(0.996 - 1.248)		(0.970 - 1.288)	(0.968 - 1.285)
High % catheter use		1.737***		1.282***	1.246**
		(1.502 - 2.009)		(1.079 - 1.524)	(1.047 - 1.482)
High % UTI		1.432***		1.375***	1.375***
		(1.247 - 1.645)		(1.168 - 1.618)	(1.168 - 1.619)
High average ADL		1.669***		1.177**	1.158**
		(1.482 - 1.879)		(1.020 - 1.359)	(1.002 - 1.337)

Independent variables ("High" = above median)	Odds of being high percentage MA facility				
	Model 1	Model 2	Model 3	Model 4	Model 5
Facility structural characteristics					
High occupancy rate	0.873**		0.883*	0.856**	0.865**
	(0.769 - 0.991)		(0.778 - 1.003)	(0.753 - 0.972)	(0.761 - 0.984)
High number of total beds	0.786***		0.784***	0.707***	0.710***
	(0.688 - 0.898)		(0.685 - 0.898)	(0.614 - 0.814)	(0.616 - 0.819)
For profit	0.827**		0.844**	0.827**	0.841**
	(0.713 - 0.959)		(0.728 - 0.979)	(0.713 - 0.960)	(0.724 - 0.976)
Hospital based	1.192		1.120	1.189	1.128
	(0.889 - 1.600)		(0.834 - 1.505)	(0.885 - 1.598)	(0.839 - 1.516)
Part of a chain	1.195***		1.191***	1.201***	1.196***
	(1.054 - 1.356)		(1.049 - 1.352)	(1.058 - 1.363)	(1.053 - 1.358)
Patient Demographics					
High average age, years	1.523***		1.528***	1.504***	1.506***
	(1.296 - 1.790)		(1.299 - 1.796)	(1.276 - 1.774)	(1.277 - 1.777)
High % White	0.958		0.958	0.945	0.944
	(0.810 - 1.134)		(0.809 - 1.133)	(0.797 - 1.121)	(0.795 - 1.120)
High % Black	1.308***		1.317***	1.312***	1.320***
	(1.095 - 1.563)		(1.102 - 1.575)	(1.097 - 1.570)	(1.103 - 1.580)
High % Hispanic	0.525***		0.539***	0.517***	0.531***
	(0.428 - 0.644)		(0.439 - 0.662)	(0.421 - 0.636)	(0.431 - 0.653)
High % Female	0.898		0.903	0.866*	0.872*
	(0.777 - 1.037)		(0.782 - 1.043)	(0.748 - 1.002)	(0.753 - 1.009)

Independent variables ("High" = above median)	Odds of being high percentage MA facility				
	Model 1	Model 2	Model 3	Model 4	Model 5
Patient Case Mix					
High % SNF (postacute) days	1.732***		1.666***	1.645***	1.596***
	(1.498 - 2.002)		(1.439 - 1.930)	(1.420 - 1.907)	(1.375 - 1.852)
High % admitted from hospital	1.543***		1.499***	1.478***	1.448***
	(1.344 - 1.772)		(1.304 - 1.723)	(1.285 - 1.700)	(1.257 - 1.666)
High % Medicaid	0.681***		0.699***	0.688***	0.703***
	(0.595 - 0.781)		(0.609 - 0.801)	(0.600 - 0.789)	(0.612 - 0.806)
Geographic characteristics					
Medicare managed care penetration	1.098***		1.098***	1.097***	1.097***
	(1.092 - 1.104)		(1.092 - 1.104)	(1.091 - 1.103)	(1.091 - 1.103)
Midwest (ref: Northeast)	1.117		1.172*	1.132	1.180*
	(0.941 - 1.327)		(0.985 - 1.394)	(0.949 - 1.351)	(0.988 - 1.410)
South (ref: Northeast)	0.583***		0.631***	0.563***	0.608***
	(0.481 - 0.707)		(0.516 - 0.770)	(0.463 - 0.684)	(0.496 - 0.744)
West (ref: Northeast)	1.208*		1.233**	1.131	1.158
	(0.986 - 1.479)		(1.006 - 1.511)	(0.922 - 1.388)	(0.942 - 1.422)
Number of Observations	6,935	6,935	6,935	6,935	6,935

Notes. "High" versus reference group of low has cut-off at the median for each characteristic. Sample of nursing homes (NH) in 2010 with reported share of Medicare Advantage (MA). 95% confidence intervals in parentheses. Abbreviations: Registered nurse (RN); Licensed practical nurse (LPN); Certified nursing assistant (CNA); Urinary tract infection (UTI); Activities of daily living (ADL); Skilled nursing facility (SNF).
*** p<0.01, ** p<0.05, * p<0.1

Table 4.3: Changes in percentage of Medicare Advantage (MA) residents after Nursing Home Compare (NHC) was initially introduced in 2002

		Changes in percentage of MA after NHC vs. before NHC with an independent variable increase of:	
Independent Variables	Mean	50%	10%
Staffing levels *(higher is better)*			
RN hours/resident day	0.33	0.08%***	0.02%***
LPN hours/resident day	0.73	0.02%	0.01%
CNA hours/resident day	2.16	0.16%*	0.03%*
Total nurse staff hours/resident day	3.19	0.18%*	0.04%*
Quality measures *(lower is better)*			
% walking not improved	75.8	-0.04%	-0.01%
% bowel incontinence	50.8	-0.30%	-0.06%
% urinary incontinence	61.4	0.65%***	0.13%***
% catheter use	7.43	0.11%	0.02%
% with UTI	10.6	-2.36%***	-0.47%***
Average ADL	15.4	0.01%	0.002%

Notes. n=49,653 nursing home years. Sample of nursing homes (NH) with reported share of Medicare Advantage (MA) from 2000-2005, excluding 2002 (introduction of Nursing Home Compare). Variable of interest the interaction of the continuous independent variable and a binary pre- or post-Nursing Home Compare introduction (See equation in Methods). Multivariate linear regression model control for the independent variable, indicator pre-post NHC introduction, facility structural characteristics (occupancy rate, total beds, for profit status, hospital based facility, part of chain), facility's patient demographics (average age, % White, % Black, % Hispanic, % female), facility's patient case mix (% NH days covered by skilled nursing days, % admitted from hospital, % Medicaid), and facility's geographic characteristics (Medicare managed care penetration), with facility and year fixed effects. Abbreviations: Registered nurse (RN), Licensed practical nurse (LPN); Certified nursing assistant (CNA); Activities of daily living (ADL). Definitions: total nurse staff hours/resident day is the total of RN, LPN, and CNA hours/resident day. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4.4: Changes in percentage of Medicare Advantage (MA) residents after Nursing Home Compare (NHC) transitioned to Star Rating in 2008

		Changes in percentage of MA after NHC vs. before NHC Star Rating with an independent variable increase of:	
Independent Variables	Mean	50%	10%
Staffing levels *(higher is better)*			
RN hours/resident day	0.36	0.13%**	0.03%**
LPN hours/resident day	0.81	0.07%	0.014%
CNA hours/resident day	2.2	-0.70%***	-0.14%***
Total nurse staff hours/resident day	3.4	-0.52%***	-0.10%***
Quality measures *(lower is better)*			
% walking not improved	80.5	2.33%***	0.47%***
% bowel incontinence	51.8	-0.15%	-0.03%
% urinary incontinence	63.4	0.59%	0.12%
% catheter use	8.5	5.35%***	1.07%***
% with UTI	11.5	3.59%**	0.72%**
Average ADL	16.1	1.6%***	0.32%***

Notes. n=29,975 nursing home years. Sample of nursing homes with reported share of Medicare Advantage (MA) from 2006-2010, excluding 2008 (introduction of Nursing Home Compare Star Rating). Variable of interest the interaction of the continuous independent variable and a binary pre- or post-Nursing Home Compare star rating. Multivariate linear regression model control for the independent variable, indicator pre-post NHC transition to star rating, facility structural characteristics (occupancy rate, total beds, for profit status, hospital based facility, part of chain), facility's patient demographics (average age, % White, % Black, % Hispanic, % female), facility's patient case mix (% NH days covered by skilled nursing days, % admitted from hospital, % Medicaid), and facility's geographic characteristics (Medicare managed care penetration), with facility and year fixed effects. Abbreviations: Registered nurse (RN), Licensed practical nurse (LPN); Certified nursing assistant (CNA); Activities of daily living (ADL). Definitions: total nurse staff hours/resident day is the total of RN, LPN, and CNA hours/resident day. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Appendix Table 4.1: Nursing home characteristics by missing and non-missing covariate observations, 2010

	Non-missing		Missing		
(n)	**5,727**		**1,208**		
	mean	sd	mean	sd	p-value
Staffing levels (higher is better)					
Total RN hours/resident day	0.4	0.26	0.52	0.64	<0.01
Total LPN hours/resident day	0.82	0.3	0.85	0.61	0.05
Total CNA hours/resident day	2.1	0.78	2.6	1.2	<0.01
Total nurse hours/resident day	3.3	0.91	3.9	1.7	<0.01
Quality measures (lower is better)					
% walking not improved	83.6	10.4	78.5	19.1	<0.01
% bowel incontinence	52.4	13.3	51.4	16.4	0.02
% urinary incontinence	64.5	12.2	63.9	15.6	0.13
% catheter use	7.8	3.7	6.0	6.3	<0.01
% UTI	11.8	3.4	10.6	4.4	<0.01
Average ADL (0-28)	16.8	2.7	15.3	4.7	<0.01
Facility structural characteristics					
% occupied	85.3	12.5	81.5	17.3	<0.01
Total beds in facility	130.6	71.9	68.6	48.5	<0.01
For profit	71%		50%		<0.01
Hospital based	3%		16%		<0.01
Part of a chain	59%		39%		<0.01

(n)	Non-missing 5,727		Missing 1,208		
Patient demographics					
Average age, years	80.5	6.2	77.6	11.7	<0.01
% White	82	21.9	87.8	17.7	<0.01
% Black	9.4	18.2	9.7	24.2	0.58
% Hispanic	2.7	9.1	3.4	14.2	0.02
% Female	70.2	11.2	66.5	15.9	<0.01
Patient case mix					
% NH days were SNF covered days	19.2	12.1	17.4	9.4	<0.01
% admitted from hospital	80.5	15.6	81.6	13.9	0.08
% Medicaid	61.3	18.9	63.3	17.1	<0.01
Geographic characteristics					
Medicare managed care penetration	26.1	14.1	24.9	16.7	<0.01
Region					<0.01
Northeast	24%		13%		
Midwest	31%		40%		
South	27%		21%		
West	18%		26%		

Notes. Sample includes nursing homes in 2010 with reported percentage of Medicare Advantage (MA) residents. Missing category includes observations with any missing variable. T-tests are performed to compared the mean between the two groups, except for Region where one-way ANOVA tests were used to see if at least one group mean was statistically different from the other group means; p-values are reported. Quality measure % walking improved was reverse coded for ease of interpretation (lower is better). Abbreviations: Registered nurse (RN), Licensed practical nurse (LPN); Certified nursing assistant (CNA); Urinary tract infection (UTI); Activities of daily living (ADL); Skilled nursing facility (SNF). Definitions: total nurse staff hours/resident day is the total of RN, LPN, and CNA hours/ resident day.

Appendix Table 4.2: Adjusted odds ratios for being a high percentage MA facility by nursing home characteristics without missing covariate observations, 2010

	Odds of being high percentage MA facility				
Independent variables ("High" = above median)	Model 1	Model 2	Model 3	Model 4	Model 5
Staffing levels (higher is better)					
High RN hours/resident day		2.029***	1.334***		1.303***
		(1.805 - 2.280)	(1.160 - 1.536)		(1.131 - 1.501)
High LPN hours/resident day		1.167***	1.187**		1.143*
		(1.040 - 1.310)	(1.037 - 1.359)		(0.997 - 1.311)
High CNA hours/resident day		1.063	1.025		1.025
		(0.949 - 1.189)	(0.897 - 1.171)		(0.896 - 1.172)
Quality measures (lower is better)					
High % walking not improved		1.100		1.021	1.016
		(0.973 - 1.244)		(0.887 - 1.175)	(0.883 - 1.170)
High % bowel incontinence		0.991		0.967	0.971
		(0.872 - 1.126)		(0.821 - 1.138)	(0.824 - 1.143)
High % urinary incontinence		1.070		1.090	1.089
		(0.944 - 1.212)		(0.935 - 1.271)	(0.934 - 1.270)
High % catheter use		1.772***		1.262**	1.225**
		(1.523 - 2.062)		(1.057 - 1.508)	(1.024 - 1.465)
High % UTI		1.462***		1.384***	1.384***
		(1.266 - 1.688)		(1.172 - 1.633)	(1.172 - 1.635)
High average ADL		1.719***		1.201**	1.172**
		(1.508 - 1.959)		(1.029 - 1.402)	(1.003 - 1.370)

	Odds of being high percentage MA facility				
Independent variables ("High" = above median)	Model 1	Model 2	Model 3	Model 4	Model 5
Facility structural characteristics					
High occupancy rate	0.932		0.942	0.913	0.924
	(0.812 - 1.070)		(0.820 - 1.083)	(0.795 - 1.050)	(0.803 - 1.063)
High number of total beds	0.952		0.952	0.857**	0.864*
	(0.822 - 1.101)		(0.821 - 1.104)	(0.735 - 0.998)	(0.740 - 1.009)
For profit	0.861*		0.879	0.855*	0.871*
	(0.732 - 1.013)		(0.747 - 1.035)	(0.726 - 1.007)	(0.739 - 1.026)
Hospital based	1.023		0.971	0.990	0.951
	(0.677 - 1.546)		(0.641 - 1.469)	(0.653 - 1.501)	(0.626 - 1.442)
Part of a chain	1.056		1.051	1.066	1.062
	(0.920 - 1.211)		(0.915 - 1.207)	(0.928 - 1.225)	(0.924 - 1.220)
Patient Demographics					
High average age, years	1.423***		1.423***	1.420***	1.416***
	(1.194 - 1.696)		(1.193 - 1.696)	(1.187 - 1.698)	(1.184 - 1.694)
High % White	0.947		0.949	0.932	0.934
	(0.789 - 1.138)		(0.790 - 1.140)	(0.773 - 1.122)	(0.775 - 1.125)
High % Black	1.379***		1.389***	1.392***	1.401***
	(1.138 - 1.670)		(1.146 - 1.684)	(1.147 - 1.689)	(1.155 - 1.701)
High % Hispanic	0.551***		0.567***	0.544***	0.559***
	(0.442 - 0.687)		(0.455 - 0.708)	(0.436 - 0.679)	(0.447 - 0.699)
High % Female	0.930		0.935	0.897	0.904
	(0.795 - 1.089)		(0.798 - 1.095)	(0.765 - 1.052)	(0.770 - 1.060)

	Odds of being high percentage MA facility				
Independent variables ("High" = above median)	Model 1	Model 2	Model 3	Model 4	Model 5
Patient Case Mix					
High % SNF (postacute) days	2.284***		2.183***	2.189***	2.111***
	(1.953 - 2.672)		(1.863 - 2.558)	(1.867 - 2.566)	(1.798 - 2.478)
High % admitted from hospital	1.409***		1.368***	1.343***	1.314***
	(1.213 - 1.636)		(1.177 - 1.590)	(1.155 - 1.562)	(1.129 - 1.530)
High % Medicaid	0.696***		0.716***	0.710***	0.727***
	(0.599 - 0.808)		(0.616 - 0.832)	(0.611 - 0.825)	(0.625 - 0.845)
Geographic characteristics					
Medicare managed care penetration	1.092***		1.091***	1.090***	1.090***
	(1.085 - 1.098)		(1.085 - 1.098)	(1.084 - 1.097)	(1.083 - 1.097)
Midwest (ref: Northeast)	1.034		1.075	1.034	1.070
	(0.860 - 1.243)		(0.893 - 1.294)	(0.856 - 1.249)	(0.885 - 1.295)
South (ref: Northeast)	0.540***		0.574***	0.523***	0.556***
	(0.441 - 0.661)		(0.465 - 0.709)	(0.427 - 0.642)	(0.450 - 0.688)
West (ref: Northeast)	1.321**		1.344***	1.234*	1.259**
	(1.061 - 1.644)		(1.079 - 1.675)	(0.990 - 1.540)	(1.008 - 1.573)
Observations	5,724	5,724	5,724	5,724	5,724

Notes. "High" versus reference group of low has cut-off at the median for each characteristic. Sample of nursing homes (NH) in 2010 with reported share of Medicare Advantage (MA) and with non-missing covariates. 95% confidence intervals in parentheses. Abbreviations: Registered nurse (RN); Licensed practical nurse (LPN); Certified nursing assistant (CNA); Urinary tract infection (UTI); Activities of daily living (ADL); Skilled nursing facility (SNF). *** p<0.01, ** p<0.05, * p<0.1

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CHAPTER FIVE

CONCLUSION

Overview and Synthesis of Findings

This dissertation has examined the role of privately administered, Medicare Advantage (MA) health plans on postacute and nursing home care. Overall, we find that risk factors pertinent to the frail elderly captured in administrative claims data are predictive of postacute utilization in both MA and FFS Medicare, and that controlling for these risk factors explains away some of the unadjusted observed differences in MA and FFS postacute utilization. There is no evidence that greater MA penetration in a county impact the postacute destination in the FFS Medicare or overall Medicare market. Furthermore, there is no evidence that MA patients (or their plans) differentially selected higher quality nursing homes after public reporting programs were introduced to help consumers select providers.

In the first two papers, we explore the interaction between the MA program and traditional fee-for-service Medicare providers in Florida, a state with one of the largest number of Medicare enrollees in the nation. Using state wide hospital discharge data, first we compare utilization and quality patterns of relevance to postacute care across MA and FFS, and second we examine the impact of MA enrollment on utilization patterns at the county level among FFS beneficiaries. Prior studies have focused on adjusting for clinical factors when estimating the differences between MA and FFS postacute utilization and outcomes. Chapter 2 expands our understanding of currently available administrative based non-clinical data in prediction. Prior studies have also largely focused on inpatient and outpatient services when examining the effects of MA enrollment on FFS utilization in the same market. Chapter 3 focuses on a different set of services, which have expanded in use and costs in the Medicare program for the last decade and addresses concerns in

non-random selection into MA. In combination, chapters 2 and 3 demonstrate the need to address risk selection in health systems and suggest the potential drawbacks of not doing so – potentially overestimating the benefits that may be associated with private managed care plans.

Risk adjustment in Medicare Advantage has strengthened over the years by transitioning from adjusting for basic demographic information to the CMS Hierarchical Conditions Category (HCC) system that includes both inpatient and outpatient diagnostic information (Newhouse, Price, McWilliams, Hsu, & McGuire, 2015). However, there is still concern of favorable risk selection into MA plans from FFS Medicare among high-need populations. In particular, recent research has demonstrated that beyond HCCs, beneficiaries with complex chronic conditions, worse activities of daily living, and frailty diagnoses have higher disenrollment rates from MA when compared with non-high-need patients (Li, Trivedi, et al., 2018; Meyers, Mor, & Rahman, 2018; Rahman, Keohane, Trivedi, & Mor, 2015; Riley, 2012). Chapter 2 demonstrated that adjusting for geriatric risk is important when assessing differences in utilization and quality between MA and FFS hospitalized patients. Chapter 3 further demonstrated that, at the county level, when we attempted to control for MA plan entry and enrollment, we did not see significant decreased use of high intensity postacute services. Taken together, these findings suggest that when interpreting the value add of private Medicare plans, we should not only assess the care that is delivered to its enrollees but also the care that is influenced by the program to non-enrollees.

In the third paper, using a comprehensive compilation of national data on nursing homes, we elucidate the association between the percentage of patients in a facility

covered by Medicare Advantage and the care quality and staffing characteristics of those facilities. Prior studies have focused on patient selection by clinical risk after public reporting in nursing homes but relatively few have focused on patient insurance coverage. Chapter 4, leveraging the different incentives that exist by payer source, focuses on patient selection by MA coverage after public reporting. In this analysis, we also include information on patients receiving both postacute care and long-term nursing home care. We find that MA patients (and plans) are not influenced by national public reporting programs in directing their enrollees to nursing home care. In combination, chapters 2 and 4 suggest that the MA program may be guiding post-hospital care differently compared to FFS but that the program may not be using quality information available to the public.

Previous work in Medicare Advantage examine where and why insurers choose to enter the MA market (Frakt, Pizer, & Feldman, 2012), the structure of the MA market (Pizer & Frakt, 2002) the costs and quality of plan offerings (Ayanian et al., 2013; Johnson, Lyon, & Frakt, 2017), and the variation in service use between MA and FFS Medicare (Li, Rahman, et al., 2018). There is little understanding in the mechanisms through which Medicare Advantage contracts with providers and establishes their networks (Feyman, Figueroa, Polsky, Adelberg, & Frakt, 2019). That is, how do MA plans weigh quality and costs of providers when negotiating their networks? Chapter 2 demonstrated that, controlling for observable patient characteristics, MA appears to be using less intense postacute settings than FFS. Chapter 4 demonstrated that there were no significant effects of quality reporting on where MA enrollees received nursing home

care. Taken together, these findings suggest that MA plans may be establishing their care patterns reliant on cost structures more so than quality metrics.

Overall Limitations and Strengths

The findings from these three studies should be considered in the context of their limitations and strengths. We use abstracted inpatient data from the Healthcare Cost and Utilization Project (HCUP) state databases for Florida to identify the experience of Medicare Advantage patients. Although data from Florida is arguably one of the best *single* state database to use for this type of analysis, it may not be fully generalizable to the entire MA program. The HCUP state inpatient databases have been previously used to identify the experiences of MA patients, but they are limited in scope to patients having had an inpatient hospital stay and residing in one of the five states that distinguish MA from FFS Medicare coverage (Baicker, Chernew, & Robbins, 2013; Nicholas, 2011).

Because MA is administered by private firms, utilization and cost data is more difficult to obtain compared to fee-for-service Medicare. For example, past research into MA rely on convenience sampling of one or several major insurers administering MA plans. Researchers also obtain information from Medicare Beneficiary Enrollment Summary File for demographic information, Medicare's Healthcare Effectiveness Data and Information Set (HEDIS) on plan information, and assessment data in each setting (i.e. Minimum Data Set [MDS] for skilled nursing or Outcome and Assessment Information Set [OASIS] for home health) for limited utilization and risk adjustment measures. More recently, researchers have used "information-only" MA claims from hospitals receiving disproportionate-share hospital or medical education payments from

Medicare to abstract limited information on utilization (Huckfeldt, Escarce, Rabideau, Karaca-Mandic, & Sood, 2017). Currently, there are efforts to release Medicare Advantage encounter data, with its limitation partly contributing to limited public knowledge on the value of MA to its beneficiaries. As MA encounter data continues to be released and strengthened, additional information on the experience of all MA enrollees will help policymakers design efficient and effective programs.

Second, quality measures used in Paper 3 are mainly self-reported by nursing homes. In particular, staffing levels used in public reporting have traditionally been levels reported by an administrator who provides information that is representative of the prior two weeks in the Online System for Certification and Administrative Reporting (OSCAR). There is limited ability to verify these staffing characteristics. The Affordable Care Act (ACA) required facilities to electronically submit direct care staffing information based on payroll and other auditable data through the Payroll-Based Journal (PBJ), which will improve the accuracy of these measures and the assessment of their relationship on quality and other outcomes. Furthermore, because we do not observe the actual contracts negotiated with private managed care plans, we can only infer these relationships related to reported quality and staffing based on the nursing homes MA enrollees actually use.

Directions for Future Research

This thesis raises a number of important questions that could not be answered in the current research. One area for further study is the intensity of postacute services provided to MA and FFS patients. Chapters 2 and 3 only explore the probability of

entering each destination but not the intensity of services provided at each destination. Past research has demonstrated that MA patients with hip fractures admitted to skilled nursing facilities (SNF) after a hospital stay spent fewer days in the SNF and received fewer minutes of total rehabilitation therapy than their FFS counterparts (Kumar et al., 2018). We do not know if this difference in the level of intensity once admitted to a postacute setting holds across clinical cohorts and settings. While studies have shown that the choice of setting, rather than the intensity, has played a large role in the variation of postacute spending, studying the intensity can paint a fuller picture of the care provided in MA plans versus FFS Medicare (Chen et al., 2017).

The large variation that occurs among postacute use raises the question of what is the most appropriate setting and level of care for post-hospital discharge (Kane, Lin, & Blewett, 2002). A number of patient-, provider-, and area-level factors affect the use of postacute and choice of postacute settings, but it appears that, in addition to financial incentives, practice styles and supply play a dominant force (Kane et al., 2002). Research should continue to develop best-practices and treatment protocols for postacute and this information should also be incorporated into a rational payment policy for Medicare postacute based on the costs of the most effective modes of care.

An important question we could not answer in this thesis is whether geriatric factors identified can be used for risk identification prior to inpatient stay. Rather than assessing risk after a patient has been admitted, risk identification can be used prior to admission by health systems to limit exposure of unnecessary inpatient and postacute stays. Linking longitudinal outpatient and inpatient data, rather than the use of cross-sectional inpatient data, may be helpful in this exploration. Further, the advancement of

other types of data sources, such as electronic health records, may be a fruitful endeavor to pursue by using real-time information to identify high risk patients in large health systems.

Additionally, an important issue to consider is to examine which quality of care measures are most meaningful in nursing homes. In the context of payment reform initiatives, quality measures that accurately reflect the process and outcomes provided by nursing homes are important. However, nursing home residents and their families may value other important aspects of care currently not captured in administrative claims and MDS assessments on Nursing Home Compare. For example, accountable care organizations performance standards and Medicare Advantage star ratings incorporate patient experience and satisfaction metrics, which are used in part to determine payments and bonuses.

This study also raises a number of broader research themes that should be explored in the future. The healthcare system has become increasingly concentrated in the past few years and consolidations are projected to continue. While prior research has studied the effects of insurer and hospital consolidation, future research should also examine the effects of other types of integration – both formal and informal (Dafny, Duggan, & Ramanarayanan, 2012; Gaynor, Ho, & Town, 2015; Ho & Lee, 2017; Moriya, Vogt, & Gaynor, 2010; Trish & Herring, 2015). In particular, prior research in MA and postacute context has demonstrated that hospital and skilled nursing referral linkages reduce rehospitalizations but that MA concentration in nursing homes do not improve patient outcomes (Rahman, Foster, Grabowski, Zinn, & Mor, 2013; Rahman, Meyers, & Mor, 2018). Exploring private managed care relationships with hospital providers and

non-physician group based providers may elucidate areas for policy and regulatory interventions aimed at controlling costs and improving quality.

A second broad area of research should investigate the data needs in care transitions that occur between hospitals and postacute providers. The Improving Medicare Post-Acute Care Transformation (IMPACT) Act of 2014 addressed issues related to standardization of data and submissions of data across postacute providers and exchange of data between other providers. Standardized data may help with determining appropriate postacute use when comparing outcomes across settings; exchange of data between providers may help with errors and continuity of care. These new data sources will be beneficial in conducting future research in the value add of postacute services.

Implications for Practice and Policy

These three papers in this dissertation represent some of the first studies examining additional risk factors in predicting postacute utilization and differences between MA and FFS patients, exploring the relationship of MA enrollment on county level effects of postacute utilization, and testing whether MA plans and consumers responded to public reporting of quality measures in nursing homes.

This dissertation research has several important practice and policy implications. As policymakers continually reform the healthcare delivery system, risk adjustment will be important in ensuring equitable and fair access to and payment across a range of care models. While this study does not answer the debate whether to include 'social risk factors' in risk adjustment for Medicare payment models, it does demonstrate that certain non-clinical factors can be conceptualized using existing administrative data, are predictive of utilization, and do narrow differences across payment models when

assessing utilization and costs. A more salient tool that this study provides may be for health systems to utilize the proposed risk factors to identify high-risk patients for additional targeted care management support.

Second, the role of capitated payment models will most likely continue to expand given the urgent need to reduce healthcare system costs while maintaining or improving quality. Understanding the impact of enrollment into capitated programs on patients with other types of insurance coverage is an important social welfare and public policy question. Not only is it important to assess the efficient delivery of patient care in capitated systems (*within* system*)*, it is also important to assess the impact of that care delivery on other patients (*between* systems*)*. In effect, should the federal government encourage enrollment in these types of plans because they offer better care to its own patients *and* provide positive externalities to other patients? If not, what are the costs and benefits policymakers are willing to accept of enrolling in these plans, relative to remaining in non-capitated plans? This study begins to elucidate some of the impacts of managed care enrollment on non-acute care services and provides some evidence as to whether MA offers better care for its own patients and provide positive spill over into FFS patients. These issues are especially pertinent when risk selection can occur between capitated and non-capitated systems that impact fiscal expenditures by the government and access to providers by patients.

Third, the impact of quality reporting on different healthcare stakeholders should be detangled. The two main objectives of the public release of performance data are to increase the accountability of providers and to maintain standards or improve the quality of care provided (Marshall, Shekelle, Leatherman, & Brook, 2000). The former offers

patients, payers, and purchasers of healthcare more informed basis of treatment or purchasing decisions. Much of the focus has been on the effects of selecting high-quality providers by patients and less has been on the effects of physician referral to or purchasers contracting with high quality providers (Werner & Asch, 2005). Although limited, available evidence suggests that public report cards have had a minor influence on purchasing decisions by managed care contracts, despite an explicit preference for high quality providers (Erickson, Torchiana, Schneider, Newburger, & Hannan, 2000; Mukamel et al., 2000; Mukamel, Weimer, Zwanziger, & Mushlin, 2002). We provide another context to examine if managed care plans respond to public reporting and find results consistent with the literature that there is minimal influence. Because the use of network providers is so salient in managed care, understanding how contracts and networks are negotiated and established based on quality may achieve the actual objectives of public reporting programs.

More broadly, this research emphasizes the role of privately administered plans for seniors and their emerging care needs in the broader healthcare reform debates. Current policy and legislative actions that call for a premium support system or varying types of public option in Medicare will need to carefully consider the popularity of private plans among seniors and the quality of care these plans deliver to them. For example, most premium support proposals would treat traditional Medicare in a similar manner as private plans where the federal government makes a capitated payment on each beneficiary enrolled in traditional Medicare. The impact of these large scale capitated payments on care delivery can, and should, be explored in the current Medicare Advantage program to help design more sustainable policies. Second, the range of public

plan options will need to examine the feasibility of and impacts from eliminating or decreasing the role of private plan options in Medicare. Furthermore, the study focuses on the different providers that care for older adults outside the traditional inpatient setting. More and more seniors with complex health needs will require care in addition to that setting. How the federal public insurance program is designed and equipped to handle that shift will be important to monitor and alter in the upcoming years.

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PROFESSIONAL EXPERIENCE

Committee on Health, Education, Labor, and Pensions
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Office of the Assistant Secretary for Planning and Evaluation
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Life Sciences, Global Business Services
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PUBLICATIONS

Wu, S., Mulcahy, J., Kasper, J., Kan, H., Weiner, J. Comparing Survey Based Frailty Assessment to Medicare Claims in Predicting Health Outcomes and Utilization in Medicare Beneficiaries. *Journal of Aging and Health.* doi: 10.1177/0898264319851995

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INVITED to COMMENTARY

Wu, S., Leff, B. (2018). Frailty Measurement and its Contribution Clinical Care and Health Services. *Israel Journal of Health Policy Research 7*(1), 27.

WORK IN PROGRESS

Medical and Social Risk in Comprehensive Joint Replacement Bundled Program (with Mariana Socal, Casey Humbyrd, Antonio Trujillo, Gerard Anderson)

PRESENTATIONS

Geriatric Risk and Postacute Utilization and Outcomes in Hospitalized Medicare Beneficiaries. *Association for Public Policy Analysis & Management Fall Research Meeting* (Poster), Washington, DC, 2018. *Society for Postacute and Long-term Care Medicine Annual Conference* (Poster), Atlanta, GA, 2019 (**Honorable Mention for Howard Guterman Best Poster**

Award). *Post-Acute Care Conference* (Poster), Denver, CO, 2019 (scheduled). *Academy Health Annual Research Meeting* (Panel: "Care Across the Continuum for High Cost, High Need Populations"), Washington, DC, 2019.

Spillover of Managed Care in Medicare Postacute Utilization, *Academy Health Annual Research Meeting* (Poster), Washington, DC, 2019.

Telemedicine, Is It Delivering? *Academy Health Annual Research Meeting* (Chair), Seattle, WA, 2018.

Predicting Functional Outcomes and Utilization Within a Nationally Representative Medicare Cohort: Comparing Models Based on In-Person Assessments of Frailty to Risk Measures Derived from Insurance Claims. *Academy Health Annual Research Meeting* (Poster), Seattle, WA, 2018. *11th Annual Research on Aging Showcase: Center on Aging and Health at Johns Hopkins School of Medicine* (Poster), Baltimore, MD, 2018.

Frailty Severity Score and Association with Health Care Use in the Elderly Population. *Annual National Research Service Award Trainees Research Conference* (Podium), Seattle, WA, 2018.

Do Medicare Advantage Plans Respond to Public Reporting? Evidence in Nursing Homes. *7th Conference of the American Society of Health Economists* (Podium), Atlanta, GA, 2018.

Medicare Advantage and Nursing Home Quality. *Lown Institute Conference* (Podium), Washington, DC. 2018. *Academy Health Annual Research Meeting* (Poster), Seattle, WA, 2018.

Disparities in Use of Skilled Nursing Facilities Is Not Fully Explained By Differential Access to High Quality Facilities. *National Health Policy Conference* (Poster), Washington, D.C, 2017. *10th Annual Research on Aging Showcase: Center on Aging and Health at Johns Hopkins School of Medicine* (Poster), Baltimore, MD, 2017.

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Long-Term Care Services and Health Information Technology. *Workshop on Health Information Technology and Economics*. Washington, DC, 2016.

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